THE AUTOMOBILE

The A.L.A.M. Auto Girl.

A.L.A.M. TENTH NATIONAL SHOW

January 8 to 15, 1910

Designed by Gustave A. Ernest

Madison Square Garden

BIGGER AND BETTER than ever before, the annual show of the Association of Licensed Automobile Manufacturers, which opens in Madison Square Garden on the evening of January 8, will contain the fruits of fifteen years' development and growth on the part of the pioneer automobile manufacturers of America. There will be gathered the product of the oldest and most conservative members of the industry, the criterion by which all others are judged. With a few notable exceptions, the cars exhibited are intended to appeal to the class of buyers who ask the price last, rather than first; to whom elegance of line, detail and appointment is as important as mechanical perfection. The general reduction in automobile prices has, of course, been brought about by the perfection of quantity-producing machinery and the gradually won ability to use it to the

fullest advantage. Too complete reliance on the machine, however, is admitted to have an injurious tendency. Again, in the designing of parts to simplify the machine processes through which they must pass, the temptation always arises to sacrifice a point here and there to greater facility of production. Here lies the need for a class of manufacturers to whom price is no object; in whose factories, no matter how clamorous the agent, the micrometer is never fogotten. The consciousness of the inevitable comparison forms the best possible check on any lowering of the standard.

Various are the ways in which the high-priced contingent has assisted—and will assist—the class which appeals to the thinner purse. It was the demand for quality at any cost which induced the steel manufacturers to take up the different kinds of nickel, chrome-nickel and vanadium steels. Once the demand for these was established and the steel plans prepared to produce them, the prices were soon reduced to a point which made their use possible in the lower-priced cars.

In the design of their cars the makers grouped under the Association of Licensed Automobile Manufacturers have always been, as became their position, conservative. Startling features have rarely originated with them. They have persisted in a steady policy of development and refinement, and have usually found themselves on the right side.

The Association of Licensed Automobile Manufacturers has rendered worthy assistance to its members in the work of development. As an organization, it has found a wide field in the reforming of unhealthy conditions in the trade, and in the general process of stabilization. As a head office for many factories, it has done valuable service in the maintenance of laboratories and in evolving standards. To it the industry owes the standard spark-plug, which has almost entirely replaced twenty or more sizes with which accessory makers were formerly compelled to struggle: the standard bolt and nut sizes, the standard rod ends and yokes, and last, but most important of all, the A.L.A.M. horsepower formula. Much has been written both in praise and in disparagement of this formula; yet it seems that if its adoption were to remain the only tangible result of the Association's existence, that existence would not have been quite in vain.

What will be remembered as perhaps the most important event in the whole history of this Licensed Association has been signalized the past year, namely, the favorable decision granted by the courts on the Selden patent. Although there remains a widespread impression that the last word on this subject has not been said, the importance of the decision can hardly be overestimated. Its direct result was practically the doubling of the numerical strength of the Association. Regarded as an association of licensed manufacturers only, this development was of unquestionable value. Regarded in the other light, as an association of leading manufacturers, it was of still more importance.

Many changes had taken place in the industry since the first organization of these manufacturers. Other manufacturers, by dint of honorable effort, had risen to positions as high as those of the pioneers. By reason of its originally limited membership, the Association was unable to accept these as equals and confer upon them its recognition, even if the newcomers had desired this recognition at the price, of course, of paying the Association license fees. The decision confirming the Selden patent not only made it highly advisable that these newly prominent makers should become licensed, but also changed the policy of the Association so that their admittance became possible.

Much has been said about the possibility of overproduction in the automobile industry. At first it was reported—and the report met with some credence—that the object of the enlargement of the Licensed Association was to restrict the output in order to prevent the panic which, according to the same report, was otherwise inevitable. Though now generally discredited, there is food for thought in this possibility.

The automobile industry is at present in an unnatural condition; one which cannot last for but a few years more. At present the market is in the process of being "filled up." Demands for automobiles are constantly arising in new quarters. Three-quarters of the output, perhaps, is being sold to persons who have never owned an automobile before. The time is sure to come when everyone who can profitably use an automobile will have one. Then the only field for the output will be the replacing of machines worn out in service, in addition to a certain amount of natural growth. This is the state of every other great industry in the country which is not of as recent origin, and is the natural state of every industry.

When this time comes there must inevitably be a contraction of the output. That time, it is true, is still several years distant; the market is not yet "filled up," and many new fields of usefulness, particularly in the line of commercial vehicles, have so far received but scant attention. The prudent manufacturers, however, will look ahead, and prudence and foresight could take no better form than the organization of a protective association of those members of the industry whose financial standing and responsibility are undoubted. By action of such an association the natural contraction of the output can be made with the least inconvenience. The change in character may be regretted by some, yet, after all, it is for the best. The principal objects of the old association have been accomplished. The alloy steels, special machinery and special testing devices are now in general use. Moreover, the makers of popular-priced cars have now gained sufficient strength to be able to dispense with outside assistance, and in many cases they themselves are inaugurating new methods.

At this particular moment the feature of the Association of most interest is its conduct of an annual automobile show. The situation in this respect, complicated by the increased membership of the Association, it such that future developments can only be surmised. It seems probthe increased membership of the Association, is such that under the plan in force for the past few years. If the management had desired to make a supreme effort by which its work should be remembered in posterity, the coming show could hardly have been surpassed.

· THE · LIST · OF · EXHIBITORS ·

AMERICAN GASOLINE PLEASURE CARS

ALCO: American Locomotive Co., Providence, R. I.
APPERSON: Apperson Bros. Automobile Co., Kokomo, Ind.
AUTOCAR: Autocar Company, Ardmore, Pa.
BUICK: Buick Motor Co., Flint, Mich.
CADILLAC: Cadillac Motor Car Co., Detroit, Mich.
CHALMERS-DETROIT: Chalmers-Detroit Motor Co., Detroit, Mich.
COLUMBIA: Columbia Motor Car Co., Hartford, Conn.
CORBIN: Corbin Motor Vehicle Corporation, New Britain, Conn.
ELMORE: Elmore Mfg. Co., Clyde, O.
E-M-F: Everitt-Metzger-Flanders Co., Detroit, Mich.
FRANKLIN: H. H. Franklin Mfg. Co., Syracuse, N. Y.
HAYNES: Haynes Automobile Co., Kokomo, Ind.
HUDSON: Hudson Motor Car Co., Detroit, Mich.
KNOX: Knox Automobile Co., Springfield, Mass.
LOCOMOBILE: Locomobile Co. of America, Bridgeport, Conn.
LOZIER: Lozier Motor Co., New York City.
MATHESON: Matheson Motor Car Co., Wilkes-Barre, Pa.
MERCER: Mercer Automobile Co., Trenton, N. J.
OLDSMOBILE: Olds Motor Works, Lansing, Mich.
OVERLAND: Willys-Overland Company, Toledo, O.
PACKARD: Packard Motor Car Co., Detroit, Mich.
PALMER-SINGER: Palmer & Singer Mfg. Co., New York City.
PEERLESS: Peerless Motor Car Co., Cleveland, O.
PIERCE-ARROW: Pierce-Arrow Motor Car Co., Buffalo, N. Y.
POPE-HARTFORD: Pope Mfg. Co., Hartford, Conn.
ROYAL TOURIST: Royal Tourist Car Co., Cleveland, O.
SELDEN: Selden Motor Vehicle Co., Rochester, N. Y.
SIMPLEX: Simplex Automobile Co., New York City.
STEARNS: F. B. Stearns Company, Cleveland, O.
STEVENS-DURYEA: Stevens-Duryea Co., Chicopee Falls, Mass.
STUDEBAKER: Studebaker Automobile Co., South Bend, Ind.
THOMAS: E. R. Thomas Motor Co., Buffalo, N. Y.
WHITE: White Company, Cleveland, O.
WINTON: Winton Motor Carriage Co., Cleveland, O.

COMMERCIAL CARS—GASOLINE AND ELEC.

ALCO: American Locomotive Co., Providence, R. I.
ALDEN-SAMPSON: Alden-Sampson Mfg. Co., Pittsfield, Mass.
AUTOCAR: Autocar Co., Ardmore, Pa.
BAKER: Baker Motor Vehicle Co., Cleveland, O.
FRANKLIN: H. H. Franklin Mfg. Co., Syracuse, N. Y.
GENERAL VEHICLE: General Vehicle Co., Long Island City, N. Y.
HEWITT: Hewitt Motor Co., New York City.
KNOX: Knox Automobile Co., Springfield, Mass.
PACKARD: Packard Motor Car Co., Detroit, Mich.
POPE-HARTFORD: Pope Mfg. Co., Hartford, Conn.
STUDEBAKER: Studebaker Automobile Co., South Bend, Ind.
THOMAS (TAXI): E. R. Thomas Motor Co., Buffalo, N. Y.

ELECTRIC PLEASURE CARS

BABCOCK: Babcock Electric Carriage Co., Buffalo, N. Y.
BAKER: Baker Motor Vehicle Co., Cleveland, O.
BAILEY: S. R. Bailey & Co., Amesbury, Mass.
COLUMBIA: Columbia Motor Car Co., Hartford, Conn.
DETROIT: Anderson Carriage Co., Detroit, Mich.
R & L: Rauch & Lang Carriage Co., Cleveland, O.
STUDEBAKER: Studebaker Automobile Co., South Bend, Ind.
WAVERLEY: Waverley Co., Indianapolis, Ind.
WOODS: Woods Motor Vehicle Co., Chicago, Ill.

MOTOR CYCLES

American Motor Co., Brockton, Mass.
Aurora Automatic Machine Co., Chicago, Ill.
Baker, F. A. & Co., New York City.
Consolidated Mfg. Co., Toledo, O.
Eclipse Machine Co., Elmira, N. Y.
Emblem Mfg. Co., Angola, N. Y.
Excelsior Supply Co., Chicago, Ill.
Greyhound Motor Works, Buffalo, N. Y.
Harley-Davidson Motor Co., Milwaukee, Wis.
Hendee Mfg. Co., Springfield, Mass.
Herring-Curtiss Co., Hammondsport, N. Y.
Marvel Motor Cycle Co., New York City.
Merkel-Light Motor Co., Pottstown, Pa.
Miami Cycle & Mfg. Co., Middletown, O.
New Era Gas Engine Co., Dayton, O.
N. S. U. Motor Co., New York City.
Pierce Cycle Co., Buffalo, N. Y.
Reading-Standard Co., Reading, Pa.
Reliance Motorcycle Co., Owego, N. Y.
Royal Motor Works, Worcester, Mass.
S. D. Mfg. Co., New York City.

PUBLICATIONS

The Automobile, New York City.
Automobile Trade Directory, New York City.
Automobile Blue Book, New York City.
Automobile Topics, New York City.
Bicycling World, New York City.
Class Journal Co., New York City.
Chilton Printing & Publishing Co., Philadelphia, Pa.
Horseless Age, New York City.
Motor, New York City.
Motor Age, Chicago, Ill.
Motorcycling Publishing Co., New York City.
Motor Print, Philadelphia, Pa.
Motor Vehicle Publishing Co., New York City.

BEARINGS

American Ball Bearing Co., Cleveland, O.
Bretz Co., J. S., New York City.
Hess-Bright Mfg. Co., Philadelphia, Pa.
International Engineering Co., New York City.
New Departure Mfg. Co., Bristol, Conn.
R. I. V. Co., New York City.
Standard Roller Bearing Co., Philadelphia, Pa.
Timken Roller Bearing Co., Canton, O.

BODIES, TOPS AND WINDSHIELDS

Chase Co., L. C., Boston, Mass.
Cowles & Co., New Haven, Conn.
Cox Brass Mfg. Co., New York City.
Grossman, Emil, New York City.
Hayes Mfg. Co., Detroit, Mich.
Metal Stamping Co., New York City.
Mezger, C. A., New York City.
Motor Car Equipment Co., New York City.
Mutty Co., L. J., Boston, Mass.
National Auto Top Co., New York City.
Newark Rivet Works, Newark, N. J.
Novelty Mfg. Co., Waterbury, Conn.
Pantasote Co., New York City.
Rands Mfg. Co., Detroit, Mich.
Sprague Umbrella Co., Norwalk, O.
Springfield Metal Body Co., Springfield, Mass.
Troy Carriage Sun Shade Co., Troy, O.
Valentine & Co., New York City.
Vanguard Mfg. Co., Joliet, Ill.

HORNS AND SPEEDOMETERS

Auto Improvement Co., Brooklyn, N. Y.
Gabriel Horn Mfg. Co., Cleveland, O.
Hoffecker Co., Boston, Mass.
Jones Speedometer Co., New Rochelle, N. Y.
Lovell-McConnell Mfg. Co., Newark, N. J.
Nightingale Whistle Mfg. Co., New York City.
Nonpareil Horn Mfg. Co., Brooklyn, N. Y.
Recometre Co., New York City.
Riley-Klotz Mfg. Co., Newark, N. J.
Shipman Instrument Co., New York City.
Sireno Co., New York City.
Stewart & Clark Mfg. Co., Chicago, Ill.
Veeder Mfg. Co., Hartford, Conn.
Warner Instrument Co., Beloit, Wis.

CARBURETERS

Allen Auto Specialty Co., New York City.
Byrne-Kingston & Co., Kokomo, Ind.
Lovell-McConnell Mfg. Co., Newark, N. J.
Stromberg Motor Devices Co., Chicago, Ill.
Waterhouse Co., Boston, Mass.
Wheeler & Schebler, Indianapolis, Ind.

IGNITION OTHER THAN MAGNETOS

American Ever Ready Co., New York City.
Apple Electric Co., Dayton, O.
Atwater-Kent Mfg. Co., Philadelphia, Pa.
Benford, E. M., Mt. Vernon, N. Y.
Briggs & Stratton, Milwaukee, Wis.
Champion Ignition Co., Flint, Mich.
Conn. Tel. & Elec. Co., Meriden, Conn.
Eastern Carbon Co., Jersey City, N. J.
Electric Storage Battery Co., Philadelphia, Pa.
Geiszler Bros. Storage Battery Co., New York City.
Grossman, Emil, New York City.
Hardy, R. E., Co., Brooklyn, N. Y.
Heinze Electric Co., Lowell, Mass.
Herz & Co., New York City.
High Frequency Ignition Co. Los Angeles, Cal.
Jeffrey-Dewitt Co., Newark, N. J.
Lovell-McConnell Mfg. Co., Newark, N. J.
Mezger, C. A., New York City.
Motsinger Device Mfg. Co., Pendleton, Ind.
Mosler, A. R., New York City.
National Carbon Co., Cleveland, O.
National Coil Co., Lansing, Mich.
New York Coil Co., New York City.
Philadelphia Storage Battery Co., Philadelphia, Pa.
Pittsfield Spark Coil Co., Dalton, Mass.
Remy Electric Co., Anderson, Ind.
Splitdorf, C. F., New York City.
Stackpole Battery Co., New York City.
Tray Plate Battery Co., Binghamton, N. Y.
Union Battery Co., Belleville, N. J.
U. S. Light & Heating Co., New York City.
Vesta Accumulator Co., Chicago, Ill.
Willard Storage Battery Co., Cleveland, O.
Witherbee Igniter Co., Springfield, Mass.

· THE · LIST · OF · EXHIBITORS ·

MAGNETOS

Bosch Magneto Co., New York City.
Brets Co., J. S., New York City.
Champion Ignition Co., Flint, Mich.
Conn. Tel. & Elec. Co., Meriden, Conn.
Heinze Electric Co., Lowell, Mass.
Hess-Bright Mfg. Co., Philadelphia, Pa.
Herz & Co., New York City.
K-W Ignition Co., Cleveland, O.
Lavalette & Co., New York City.
Motsinger Device Mfg. Co., Pendelton, Ind.
Pittsfield Spark Coil Co., Dalton, Mass.
Remy Electric Co., Anderson, Ind.
Simms Magneto Co., New York City.
Splitdorf, C. F., New York City.

LAMPS, ELECTRIC AND OIL

Apple Electric Co., Dayton, O.
Atwood-Castle Co., Amesbury, Mass.
Badger Brass Mfg. Co., Kenosha, Wis.
Dietz Co., R. E., New York City.
Edmunds & Jones Mfg. Co., Detroit, Mich.
English & Mersick Co., New Haven, Conn.
Gray & Davis, Amesbury, Mass.
Hall, C. M., Co., Detroit, Mich.
Ham, C. T., Mfg. Co., Rochester, N. Y.
Rushmore Dynamo Works, Plainfield, N. J.

LUBRICANTS

Adam Cook's Sons, New York City.
Columbia Lubricants Co., New York City.
Dixon Crucible Co., Joseph, Jersey City, N. J.
Harris Oil Co., A. W., Providenc, R. I.
Havoline Oil Co., New York City.
Haws, Geo. A., New York City.
Keystone Lubricating Co., Philadelphia, Pa.
Miller's Sons, Wm. P., Brooklyn, N. Y.
N. Y. & N. J. Lubricant Co., New York City.
Valvoline Oil Co., New York City.
Vacuum Oil Co., New York City.
White & Bagley Co., Worcester, Mass.
Winn, Wm. R., New York City.

STRUCTURAL PARTS

American Vanadium Co., Pittsburg, Pa.
A-Z Co., New York City.
Baldwin Chain & Mfg. Co., Worcester, Mass.
Bowser, S. F. & Co., Fort Wayne, Ind.
Briscoe Mfg. Co., Detroit, Mich.
Brown-Lipe Gear Co., Syracuse, N. Y.
Carpenter Steel Co., Reading, Pa.
Coes Wrench Co., Worcester, Mass.
Columbia Nut & Bolt Co., Bridgeport, Conn.
Cook's Standard Tool Co., Kalamazoo, Mich.
Cramp & Sons Ship & Eng. Co., Philadelphia, Pa.
Diamond Chain & Mfg. Co., Indianapolis, Ind.
Driggs-Seabury Ordnance Co., Sharon, Pa.
Duff Mfg. Co., Pittsburg, Pa.
Elite Mfg. Co., Ashland, O.
Erie Foundry Co., Erie, Pa.
Franklin, H. H., Mfg. Co., Syracuse, N. Y.
Frasse, Peter A., & Co., New York City.
Gemmer Mfg. Co., Detroit, Mich.
Gilbert Mfg. Co., New Haven, Conn.
Globe Machine & Stamping Co., Cleveland, O.
Hancock Mfg. Co., Charlotte, Mich.
High Wheel Auto Parts Co., Muncie, Ind.
Janney-Steinmetz & Co., Philadelphia, Pa.
Jones, Phineas, & Co., Newark, N. J.
Johns-Manville Co., New York City.
Johnson, Isaac C. & Co., Spuyten Duyvil, N. Y.
Lavigne Mfg. Co., Detroit, Mich.
Lebanon Steel Castings Co., Lebanon, Pa.
Light Mfg. & Foundry Co., Pottstown, Pa.
Link-Belt Co., Philadelphia, Pa.
Livingston Radiator Co., New York City.
McCue Co., Hartford, Conn.
McCord Mfg. Co., Detroit, Mich.
Merchant & Evans, Philadelphia, Pa.
Noonan Tool & Machine Works, Rome, N. Y.
Perfection Spring Co., Cleveland, O.
Prosser, Thos., & Sons, New York City.
Pruden, W. A., Hardware Co.
Randall-Faichney Co., Boston, Mass.
Royal Equipment Co., Bridgeport, Conn.
Smith, A. O., Co., Milwaukee, Wis.
Spicer Universal Joint Mfg. Co., Plainfield, N. J.
Standard Welding Co., Cleveland, O.
Thermoid Rubber Co., Trenton, N. J.
Timken-Detroit Axle Co., Detroit, Mich.
Vanadium Metals Co., New York City.
Warner Gear Co., Muncie, Ind.
Warner Mfg. Co., Detroit, Mich.
Whitney Mfg. Co., Hartford, Conn.

TIRES, RIMS AND SUPPLIES

Ajax-Grieb Rubber Co., Trenton, N. J.
Batavia Rubber Co., Batavia, N. Y.
Burroughs Remountable Rim Co., New York City.
Calmon Asbestos & Rubber Works, New York City.
Consolidated Rubber Co., Akron, O.
Continental Caoutchouc Co., New York City.
Continental Rubber Co., New York City.
Dayton Rubber Mfg. Co., Dayton, O.
Diamond Rubber Co., Akron, O.
Empire Tire Co., Trenton, N. J.
Favary Tire & Cushion Co., New York City.
Federal Rubber Co., Milwaukee, Wis.
Firestone Tire & Rubber Co., Akron, O.
Fisk Rubber Co., Chicopee Falls, Mass.
Fox Metallic Tire Belt Co., New York City.
Goodrich, B. F. Co., Akron, O.
Goodyear Tire & Rubber Co., Akron, O.
G & J Tire Co., Indianapolis, Ind.
Gibney, J. L., & Bro., Philadelphia, Pa.
Hartford Rubber Works, Hartford, Conn.
Hopewell Bros., Cambridge, Mass.
Howard Demountable Rim Co., Trenton, N. J.
Leather Tire Goods Co., Niagara Falls, N. Y.
Merchant & Evans, Philadelphia, Pa.
McGraw Tire & Rubber Co., New York City.
Michelin Tire Co., Milltown, N. J.
Morgan & Wright, Detroit, Mich.
Motz Tire & Rubber Co., Akron, O.
N. J. Car Spring & Rubber Co., Jersey City, N. J.
Pennsylvania Rubber Co., Jeannette, Pa.
Republic Rubber Co., Youngstown, O.
Sager, J. H. Co., Rochester, N. Y.
Seamless Rubber Co., New York City.
Shaler, C. A. Co., Waupun, Wis.
Standard Leather Washer Co., Newark, N. J.
Stein Double Cushion Tire Co., Akron, O.
Swinehart Cushion Tire & Rubber Co., Akron, O.
Voorhees Rubber Mfg. Co., Akron, O.
Woven Steel Hose & Rubber Co., Trenton, N. J.
Zegien Bullet Proof Cloth Co., Detroit, Mich.

SHOCK ABSORBERS

Fientje, Ernest, Cambridge, Mass.
Gabriel Horn Mfg. Co., Cleveland, O.
Hartford Suspension Co., Jersey City, N. J.
Kilgore Mfg. Co., Boston, Mass.

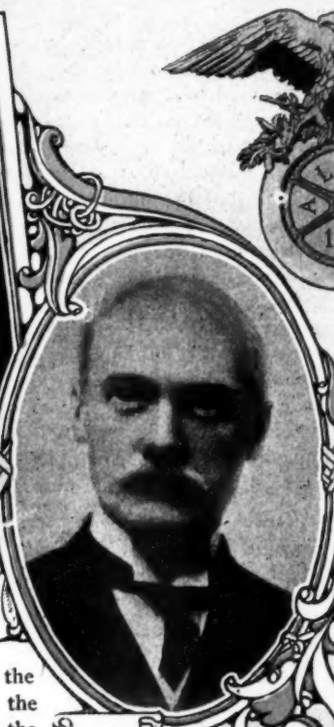
SUPPLIES

Detroit Motor Car Supply Co., Detroit, Mich.
English & Mersick Co., New Haven, Conn.
Grossman Co., Emil, New York City.
Miller, Chas. E., New York City.
New York Sporting Goods Co., New York City.
Pierson Motor Supply Co., New York City.
Post & Lester Co., Hartford, Conn.
Stevens & Co., New York City.
Victor Auto Supply Co., New York City.

MISCELLANEOUS

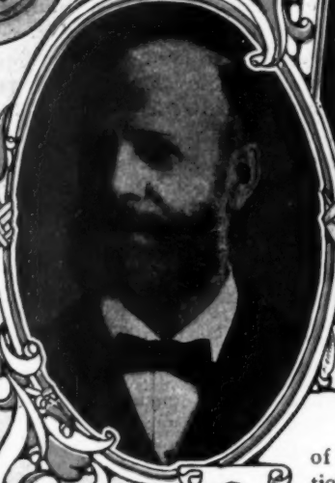
Ajax Trunk & Sample Case Co., New York City.
Allers Co., Harry A., New York City.
Asch, B. M., New York City.
Automatic Headlight Co., New York City.
Burn-Boston Battery & Mfg. Co., Boston, Mass.
Chandler Co., Pittsburg, Pa.
Cross, Frank H., New York City.
Dover Stamping & Mfg. Co., Cambridge, Mass.
Excelsior Motor & Mfg. Co., Chicago, Ill.
Gasoline Motor Efficiency Co., Jersey City, N. J.
Grimm-Plaut Construction Co., Pittsburg, Pa.
Hilton Mfg. Co., Boston, Mass.
Hoffnung & Co., New York City.
Kamlee Co., Milwaukee, Wis.
King Optical Co., Julius, New York City.
Mesinger Mfg. Co., H. & T., New York City.
Morrison-Ricker Mfg. Co., Grinnell, Ia.
Motor Parts Co., Plainfield, Mass.
Nathan Novelty Mfg. Co., New York City.
Noera Mfg. Co., Waterbury, Conn.
Oliver Mfg. Co., Chicago, Ill.
Perfection Wrench Co., Port Chester, N. Y.
Reilly & Son, Newark, N. J.
Rothstein Mfg. Co., New York City.
Tracy, Joseph, New York City.
Traver Mfg. Co., Philip C., Far Rockaway, N. Y.
Wayne Oil Tank & Pump Co., Ft. Wayne, Ind.
Weed Chain Tire Grip Co., New York City.
Willey Co., C. A., Long Island City, N. Y.
Wright Wrench Mfg. Co., Canton, O.

SHOW COMMITTEE



Coker F. Clarkson
Asst. Genl Manager

Chas. Clifton
Pres. A.L.A.M.



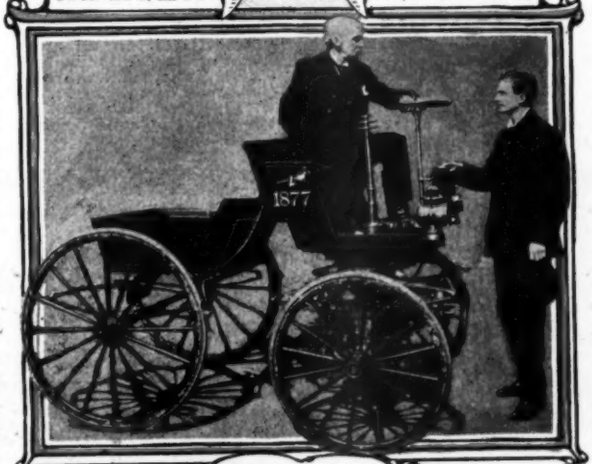
Col. Geo. Pope
Chairman
Show Committee

Merle L. Downs
Secretary

THE personality of the men comprising the Show Committee of the Association of Licensed Automobile Manufacturers assures excellence of management and careful attention to the mass of details that go to make an exhibition like the Tenth National Automobile Show, which will open for a week's run, at Madison Square Garden, New York City, on Saturday evening, January 8, a successful enterprise.

For four years the A. L. A. M. Show Committee has been headed by Colonel George Pope, under whose experienced eye and guidance each successive exhibition has advanced in character and attractiveness. No one connected with the industry has a wider range of business experience to draw upon, as he has been identified with the making of automobiles since 1897, and prior to that time was a constructor of the automobile's forerunner—the bicycle. He has served as treasurer of the Pope Manufacturing Company for many years, and his military title is one that dates from the Civil War. He was with Colonel Robert Shaw when that gallant soldier fell in the disastrous attack on Fort Wagner, July 18, 1863, and led the veterans of the Fifty-fourth Massachusetts Volunteers in the ceremonies attendant upon the unveiling of the famous Shaw Memorial on Beacon Hill, Boston, about ten years ago.

President Charles Clifton of the A. L. A. M., the second member of the Show Committee, has been prominently identified with the automobile industry since 1898, and has served with credit in many capacities that have identified him with publicly proclaiming the advantages of the motor-driven vehicle. He has always been an active participant in the business affairs of the A. L. A. M. and his election to the presidency of that successful organization was the natural culmination of his energetic work in its behalf. He is treasurer of the Pierce-Arrow Motor Car Company, of Buffalo, N. Y., itself a veteran business enterprise which had its inception in the early days of the bicycle.



Selden, Sr. and Jr.

For six years, Secretary Merle L. Downs, the third member of the committee, has attended to the detail work connected with A. L. A. M. Shows and has done it so well that he has won a recognized position as successful engineer of enterprises of that nature. His knowledge of the automobile business and its requirements is wide and varied, and in the early days of the industry he was prominently identified with the management of racing and touring events that gave wide publicity to the automobile as a self-propelled means of locomotion and helped materially to popularize it.

Although not a member of the Show Committee, Assistant General Manager Coker F. Clarkson, of the A. L. A. M., has much to do with the arrangements. He is the compiler of the A. L. A. M. handbooks, and is secretary of its mechanical branch. This naturally makes him a valuable authority for the committee to consult with, and his wide range of knowledge in engineering and other matters is of great service in the accomplishment of details requiring exactitude and dispatch. Mr. Clarkson is a lawyer by profession.

In the process of standardization of methods, formula, and materials, Mr. Clarkson has been a power to conjure by, and in contests, the fair and conservative attitude always assumed by him has made for him a host of friends, besides commanding the respect of opponents.

·THE·A·L·A·M·SHOW·

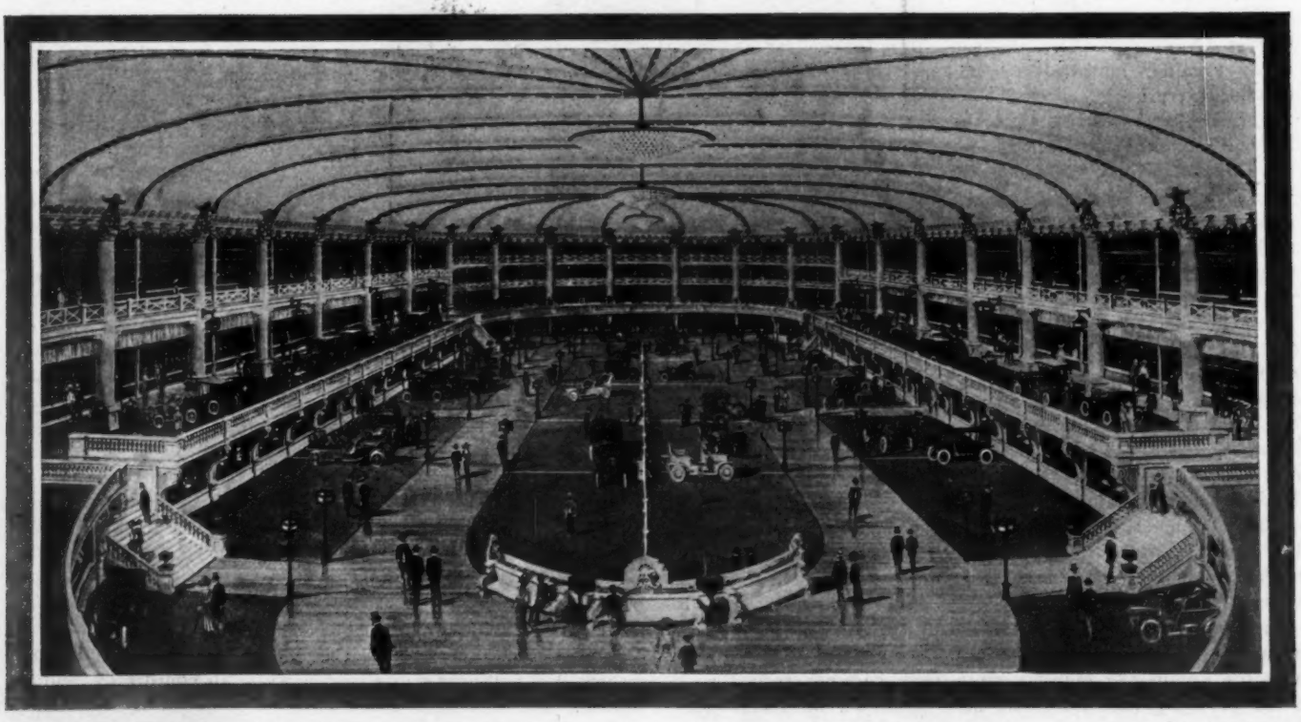
LICENSED ASSOCIATION OVERFLOWS GARDEN

EXPANDED by numerous acquisitions from the ranks of the A. M. C. M. A., the A. L. A. M. will make its 1910 début in sufficient force to overflow the Garden and present in dress uniform the finest array of automobiles the world has ever contemplated. The official list of the concerns which will exhibit under the banner of this pioneer association comprises in fact some 56 separate companies, it being the case that the Everitt car will show under the license of the Hewitt Motor Company, the White car using the license of the Waltham Manufacturing Company, and the Willys-Overland Company including the Overland and Marion under the old Pope-Toledo license.

As will be readily appreciated, the licensed association in its present form draws heavily on the ranks of the A. M. C. M. A., taking from the latter such companies as Brush, Stoddard-Dayton, Elmore, E. M. F., Hudson, Jackson, Maxwell, Mitchell, Moline, Moon, Mora, National, Premier, Regal, Reo, besides the companies which were non-members in either association. To what extent these withdrawals will affect the A. M. C. M. A. and its workings in the future is a matter with which we do not now have to deal, but the influence thus exerted on the A. L. A. M. will amount to more than a surface indication.

From what is already known, and considering the needs of the industry, it is believed that the stronger association will have a marked effect on the future, particularly in the direction of quality of the automobiles made, and to a vast extent, by way of inducing stability, all of which should react to the decided advantage of the patrons of the industry. True, prices may be maintained as they should, but the concentrated effort of the members of the association along well directed lines is bound to further the interests of the industry as a whole, and an examination of the automobiles which are to be shown this year, together with a close inspection of the plants in which they were made, renders judgment comprehensive, and prediction potent. If forecasting has any virtue, provided it is in the light of events transpired, it will have in its composition the statement to the future of the automobile industry is well assured.

American Locomotive Company	Alco
Apperson Bros. Auto Co.	Apperson
Autocar Co.	Autocar
Bartholomew Co.	Glide
Brush Runabout Co.	Brush
Buckeye Mfg. Co.	Lambert
Buick Motor Co.	Buick
Cadillac Motor Car Co.	Cadillac
Chalmers-Detroit Motor Car Co.	Chalmers-Detroit
Corbin Motor Vehicle Corp.	Corbin
Columbia Motor Car Co.	Columbia
Dayton Motor Car Co.	Stoddard-Dayton
Elmore Mfg. Co.	Elmore
Everitt-Metzger-Flanders Co.	Studebaker E-M-F Studebaker-Flanders
H. H. Franklin Mfg. Co.	Franklin
Haynes Automobile Co.	Haynes
Hewitt Motor Co.	Hewitt Truck Everitt
Hudson Motor Car Co.	Hudson
Jackson Automobile Co.	Jackson
Knox Automobile Co.	Knox
Loccmobile Co. of America	Locomobile
Lozier Motor Co.	Lozier
Matheson Motor Car Co.	Matheson
Maxwell-Briscoe Motor Co.	Maxwell
Mercer Automobile Co.	Mercer
Mitchell Motor Car Co.	Mitchell
Moline Automobile Co.	Moline
Moon Motor Car Co.	Moon
Mora Company	Mora
National Motor Vehicle Co.	National
Nordyke and Marmon Co.	Marmon
Olds Motor Works	Oldsmobile
Packard Motor Car Co.	Packard
Palmer & Singer Mfg. Co.	Palmer-Singer
Peerless Motor Car Co.	Peerless
Pierce-Arrow Motor Car Co.	Pierce-Arrow
Pope Mfg. Co.	Pope-Hartford
Premier Motor Manufacturing Co.	Premier
Regal Motor Car Co.	Regal
Reo Motor Car Co.	Reo
Royal Tourist Car Co.	Royal Tourist
Alden Sampson, 2d	Sampson Truck
Selden Motor Vehicle Co.	Selden
Simplex Automobile Co.	Simplex
F. B. Stearns Co.	Stearns
Stevens-Duryea Co.	Stevens-Duryea
Studebaker Automobile Co.	Studebaker-Garford
E. R. Thomas Motor Co.	Thomas
Waltham Mfg. Co.	White
Willys-Overland Co.	Overland, Marion
Winton Motor Carriage Co.	Winton
York Motor Car Co.	Pullman



Main Floor of Madison Square Garden, New York City, as Arranged for the Tenth National Automobile Show, January 8-15.

A · L · A · M · Cars · in · Tabular · Form

CONSTRUCTED on the same plane as the table of specifications of the cars exhibited at the A. M. C. M. A. show, which appeared last week, the following table may be regarded as complementary, and the two together give a practically complete summary of the cars at present on the market. It may be stated here, however, that in the issue devoted to the Chicago show another table will be printed which will be a combination of the present two, with the addition of every other make which is built or sold in this country on a commercial scale. That is, the Chicago show table will not be restricted to exhibitors at that show, but will be as complete as it is possible to make such a table, in view of the constant additions to the ranks of the manufacturers.

The preliminary comment on the A. M. C. M. A. table applies as well to the following table of A. L. A. M. cars. For convenience it may be briefly summarized. The prices given are marked by an asterisk when they include a Cape top. Horsepower ratings are in all cases according to the A. L. A. M. formula; two-cycle motors are not rated, but are marked by a dagger in the horsepower column. It seems fair to add in this connection that the two Elmore models, which the maker rates at 36 and 46 horsepower, differ in respect to their motors in a way which the table does not show. The 46-horsepower is a differential-piston design, and although its cylinder dimensions are the same as those of the 36-horsepower, the difference in rating seems to be justified.

Representation of each maker in the table is according to the number of distinct chassis produced, without regard to the different bodies which may be fitted. Practically all touring models will be furnished with a runabout or baby tonneau body if desired, usually at the same price.

Lubrication systems are designated as "pump," "mechanical" and "splash." The first means that the oil is circulated and used repeatedly; the second that the oil is fed to cylinders or bearings by individual pumps, the number of such pumps being indicated whenever possible, and the last that oil is simply poured in the crankcase at given intervals. The location of the change-gear box, which is becoming a detail of considerable importance, is given in the column following the description of the gear and the number of speeds. The word "motor" means that the gear-box forms a single unit with the motor; "frame," that is a separate unit supported from the main frame; and "axle," that it forms a unit with the rear axle. In the next column the word "shaft," indicating that the car is shaft-driven, is followed by a figure "1" or "2," denoting the number of universal joints in the drive-shaft.

The design of the crankshaft is indicated by the items given under the head of motor bearings. The figure indicates the number of crankshaft bearings. In describing the transmission and axle bearings it was frequently found that in many cases different kinds of bearings were used; whenever this occurred the kind which seemed to be in the majority was given the preference.

Frames on the majority of pleasure cars are of pressed steel, which is indicated in the table by the abbreviation "P. steel"; other forms are wood and "armored," or combination wood and steel. Commercial cars frequently use structural steel shapes, either angle or channel.

In the table immediately following, showing the cars classified according to price, a different scheme has been followed. All the variations in body design on any make, whether or not on the same chassis, may be found therein, provided they entail a difference of price. For instance, a runabout model selling at the same price as the touring car is not given, even though it may be on a separate chassis; but a limousine selling at a higher figure is given, although often on the touring car chassis. This condensation was necessary in order to get the size of the tables within reasonable bounds. However, the intending purchaser may always rest assured of being able to obtain a suitable body on any chassis he may fancy.

DIVISION OF THE CARS INTO SIX DIFFERENT PRICE CLASSIFICATIONS

UNDER $1,500.

$600	Maxwell AA	Runabout
750	Flanders 20	Runabout
900	Maxwell Q	Runabout
1,000	Buick 10	Roadster
1,000	Hudson 20	Roadster
1,000	Maxwell Q	Touring
1,000	Overland 38	Runabout
1,150	Buick 10	Baby tonneau
1,150	Hudson 20	Touring
1,250	E. M. F. 30	Touring
1,250	Overland 40	Roadster
1,400	Buick 19	Touring
1,400	Overland 41	Touring

$1,500 TO $1,999.

$1,500	Chalmers-Detroit 30	Touring
1,500	Maxwell E	Touring
1,500	Overland 42	Touring
1,600	Cadillac 30	Touring
1,750	Buick 17	Touring
1,750	Elmore 36	Touring
1,750	Franklin G	Runabout
1,800	Autocar XXII	Touring
1,800	Franklin G	Roadster
1,850	Franklin G	Touring
1,850	Marion 10	Touring
1,950	Mercer A	Touring

$2,000 TO $2,999.

$2,000	Apperson 4-30	Touring
2,000	Haynes 19	Touring
2,000	Selden 35	Touring
2,000	White G-A	Touring
2,250	Palmer-Singer XXX	Roadster
2,250	Selden 35	Baby tonneau
2,450	Apperson O	Touring
2,500	Elmore 36	Landaulet
2,500	Elmore 46	Touring
2,500	White G-B	Touring
2,700	Franklin D	Roadster
2,750	Chalmers-Detroit 40	Touring
2,750	Columbia Mark 48	Touring
2,750	Corbin XVIII	Touring
2,750	Pope-Hartford T	Touring
2,800	Franklin D	Touring
2,850	Stevens-Duryea X	Touring

$3,000 TO $3,999.

$3,000	Apperson 4-40	Touring
3,000	Cadillac 30	Limousine
3,000	Matheson 6-50	Touring
3,000	Oldsmobile	Touring
3,000	Selden 29	Limousine
3,000	Winton 48	Touring
3,150	Knox R	Baby tonneau
3,200	Franklin K-4	Limousine
3,200	Packard 18	Touring
3,200	Stearns 15-30	Touring
3,250	Knox R	Touring
3,300	Stevens-Duryea AA	Touring
3,350	Alco 16	Landaulet
3,350	Palmer-Singer LXI	Roadster
3,500	Locomobile L	Touring
3,500	Lozier J	Touring
3,500	Palmer-Singer LXII	Touring
3,500	Thomas M	Touring
3,600	Franklin H	Roadster
3,600	White G-B	Limousine
3,650	Palmer-Singer XXX	Limousine
3,750	Corbin XVIII	Limousine
3,750	Franklin H	Touring
3,750	Pope-Hartford T	Limousine
3,750	Stevens-Duryea X	Limousine
3,800	White G-B	Landaulet
3,850	Pierce-Arrow 36	Roadster

$4,000 TO $4,999.

$4,000	Apperson 4-50	Baby tonneau
4,000	Franklin D	Limousine
4,000	Knox R	Limousine
4,000	Pierce-Arrow 36	Touring
4,000	Stevens-Duryea Y	Touring
4,000	Studebaker G-7	Touring
4,000	Thomas R	Limousine
4,200	Apperson 4-50	Touring
4,200	Apperson 6-40	Touring
4,200	Matheson 6-50	Limousine
4,200	Packard 30	Touring
4,250	Winton 48	Limousine
4,250	Winton 60	Touring
4,300	Peerless 30	Touring
4,350	Alco 22	Landaulet
4,400	Packard 18	Limousine
4,450	Simplex 50	Chassis
4,500	Locomobile I	Touring
4,500	Packard 18	Landaulet
4,500	Royal Tourist M	Touring
4,500	Thomas F	Touring
4,600	Oldsmobile	Touring
4,600	Stearns 15-30	Landaulet
4,600	Stearns 30-60	Touring
4,700	Locomobile L	Limousine
4,750	Alco 40	Touring
4,750	Matheson 4-50	Baby tonneau
4,800	Peerless 30	Demi-limousine
4,850	Pierce-Arrow 48	Roadster
4,900	Knox S	Baby tonneau
4,900	Pierce-Arrow 36	Limousine

$5,000 AND OVER.

$5,000	Franklin H	Limousine
5,000	Knox S	Touring
5,000	Lozier H	Touring
5,000	Matheson 4-50	Touring
5,000	Pierce-Arrow 36	Landaulet
5,000	Pierce-Arrow 48	Touring
5,000	Stevens-Duryea Y	Limousine
5,000	Studebaker G-7	Limousine
5,500	Alco 40	Limousine
5,500	Peerless 30	Limousine
5,550	Packard 30	Limousine
5,650	Packard 30	Landaulet
5,700	Royal Tourist M	Limousine
5,750	Matheson 4-50	Limousine
5,750	Stearns 30-60	Limousine
5,800	Peerless 30	Landaulet
5,850	Pierce-Arrow 66	Roadster
5,850	Stearns 30-60	Landaulet
5,900	Locomobile I	Limousine
6,000	Alco 60	Touring
6,000	Knox S	Limousine
6,000	Locomobile I	Landaulet
6,000	Lozier I	Touring
6,000	Peerless 50	Touring
6,000	Pierce-Arrow 66	Touring
6,000	Thomas K	Touring
6,100	Pierce-Arrow 48	Limousine
6,200	Pierce-Arrow 48	Landaulet
6,750	Alco 60	Limousine
7,500	Thomas K	Limousine

DETAILS OF CARS EXHIBITED AT 1910 MADISON SQUARE GARDEN SHOW—AMERICAN GASOLINE PLEASURE CARS

MAKE AND MODEL	Price	H.P.	BODY		MOTOR				COOLING		IGNITION		Lubrication	Clutch	TRANSMISSION				Wheelbase	Tread	Frame	BEARINGS			Weight	TIRES	
			Type	Seats	Cylinders	Bore	Stroke	Cyl. Cast	Radiator	Pump	Magneto	Battery			Type	Speeds	Location	Drive				Motor	Transmission	Axle		Front	Rear
Alco 16	3750	24.8	Land't..	6	4	100	120	Pairs.	H'comb..	Cent'f'l..	Bosch...	None....	Mech....	Disc.....	Sel....	3	Frame..	Shaft 2.	101	55½	P. steel..	3 plain..	Ball...	Ball...	.....	32x4	32x4
Alco 22	4350	24.8	Land't..	6	4	100	120	Pairs.	H'comb..	Cent'f'l..	Bosch...	None....	Mech....	Disc.....	Sel....	3	Frame..	Shaft 2.	112	55½	P. steel..	3 plain..	Ball...	Ball...	.....	32x4	32x4
Alco 40	*4750	35.8	Tour'g..	7	4	120	150	Pairs.	H'comb..	Cent'f'l..	Bosch...	Storage..	Mech....	Disc.....	Sel....	4	Frame..	Shaft 2.	126	55½	P. steel..	3 plain..	Ball...	Ball...	.....	36x4	36x5
Alco 60	*6000	53.6	Tour'g..	7	6	120	150	Pairs.	H'comb..	Cent'f'l..	Bosch...	Storage..	Mech....	Disc.....	Sel....	4	Frame..	Shaft 2.	134	55½	P. steel..	4 plain..	Ball...	Ball...	3,900	36x4	36x5
Apperson 4-30	2000	30.6	Tour'g..	5	4	4⅜	5	Single.	Tubular.	Ecc'c....	Bosch...	Storage..	4 mech..	Con. b'd.	Sel....	3	Frame..	Shaft...	112	56	P. steel..	5 plain..	Ball...	Ball...	2,700	34x4	34x4
Apperson "O"	2450	30.6	B. tonn.	4	4	4⅜	5	Single.	Tubular.	Ecc'c....	Bosch...	Storage..	4 mech..	Con. b'd.	Sel....	3	Frame..	Shaft...	119	56	P. steel..	5 plain..	Ball...	Ball...	.....	34x4	34x4
Apperson 4-40	3000	36.1	Tour'g..	7	4	4⅜	5	Single.	Tubular.	Ecc'c....	Bosch...	Storage..	4 mech..	Con. b'd.	Sel....	3	Frame..	Shaft...	122	56	P. steel..	5 plain..	Ball...	Ball...	.....	36x4	36x4½
Apperson 4-50	4000	48.4	B. tonn.	4	4	5½	5	Single.	Tubular.	Ecc'c....	Bosch...	Storage..	4 mech..	Con. b'd.	Sel....	3	Frame..	2-chain.	116	56	P. steel..	5 plain..	Ball...	Ball...	.....	36x4	36x4½
Apperson 4-50	4200	48.4	Tour'g..	7	4	5½	5	Single.	Tubular.	Ecc'c....	Bosch...	Storage..	4 mech..	Con. b'd.	Sel....	4	Frame..	Shaft...	128	56	P. steel..	5 plain..	Ball...	Ball...	.....	36x4	36x4½
Apperson 6-40	4200	48.6	Tour'g..	7	6	4½	5	Single.	Tubular.	Ecc'c....	Bosch...	Storage..	4 mech..	Con. b'd.	Sel....	3	Frame..	Shaft...	128	56	P. steel..	7 plain..	Ball...	Ball...	.....	36x4	36x4½
Autocar XXII	1800	25.6	Tour'g..	5	4	4	4½	Single.	Tubular.	Cent'f'l..	Bosch...	Battery..	3 mech..	3-plate..	Prog..	3	Frame..	Shaft 2.	102	56	P. steel..	3 plain..	Roller.	Roller.	.....	34x3½	34x3½
Buick "10"	1150	22.5	Tour'g..	4	4	3¾	3¾	Pairs.	Tubular.	Cent'f'l..	Magneto.	Dry.....	Pump...	Cone....	Plan..	2	Frame..	Shaft...	92	56	P. steel..	3 plain..	Plain..	Roller.	.....	30x3½	30x3½
Buick "19"	1400	28.9	Tour'g..	5	4	4½	4½	Pairs.	Tubular.	Cent'f'l..	Magneto.	Dry.....	Pump...	Cone....	Sel....	3	Frame..	Shaft...	105	56	P. steel..	3 plain..	Roller.	Roller.	.....	32x4	32x4
Buick "17"	1750	32.4	Tour'g..	5	4	4½	5	Pairs.	Tubular.	Cent'f'l..	Magneto.	Dry.....	Pump...	Cone....	Sel....	3	Frame..	Shaft...	112	56	P. steel..	3 plain..	Roller.	Roller.	.....	34x4	34x4
Cadillac 30	1600	28.9	Tour'g..	5	4	4½	4½	Single.	Tubular.	Gear....	Splitd'f..	Dry.....	Pump...	Cone....	Sel....	3	Frame..	Shaft 2.	110	‡56	P. steel..	5 plain..	Ball...	Roller.	.....	34x4	34x4
Cadillac 30	3000	28.9	Limous.	7	4	4½	4½	Single.	Tubular.	Gear....	Splitd'f..	Dry.....	Pump...	Cone....	Sel....	3	Frame..	Shaft 2.	114	‡56	P. steel..	5 plain..	Ball...	Roller.	.....	34x4½	34x4½
Chalmers-D't 30	1500	25.6	Tour'g..	5	4	4	4½	Block.	Tubular.	Cent'f'l..	Extra...	Storage..	Pump...	Disc.....	Sel....	3	Motor..	Shaft 1.	115	‡56	P. steel..	2 ball...	Ball...	Roller.	.....	34x3½	34x3½
Chalmers-D't 40	2750	40.0	Tour'g..	5	4	5	4½	Pairs.	H'comb..	Cent'f'l..	Bosch...	Storage..	Pump...	Cone....	Sel....	3	Frame..	Shaft 1.	123	56	P. steel..	3 plain..	Ball...	Roller.	.....	36x4	36x4
Columbia M'k 48	2750	32.4	Tour'g..	5	4	4½	4.7	Pairs.	Cellular..	Cent'f'l..	Bosch...	Storage..	Pump...	Cone....	Sel....	3	Frame..	Shaft 2.	115	56	P. steel..	3 plain..	Ball...	Roller.	2,720	34x4	34x4
Corbin XVIII	2750	32.4	Tour'g..	5	4	4½	4½	Single.	H'comb..	Gear....	Bosch...	Dry.....	Pump...	Cone....	Sel....	3	Frame..	Shaft 2.	120	56	P. steel..	2b., 3pl.	Ball...	Ball...	2,780	34x4	34x4
Elmore 36	1750	†	Tour'g..	5	4	4½	4	Single.	Tubular.	None....	None....	Dry.....	6 mech..	Con. b'd.	Sel....	3	Frame..	Shaft...	110	56	P. steel..	5 plain..	Ball...	Roller.	2,400	34x4	34x4
Elmore 46	2500	†	Tour'g..	5	4	4½	4	Single.	Tubular.	None....	None ..	Dry.....	6 mech..	Con. b'd.	Sel....	3	Frame..	Shaft...	120	56	P. steel..	5 plain..	Ball...	Roller.	2,800	36x4	36x4
E-M-F 30	1250	25.6	Tour'g..	5	4	4	4½	Pairs.	Tubular.	Cent'f'l..	Splitd'f..	Storage..	Splash...	Cone....	Sel....	3	Axle...	Shaft...	108	‡56½	P. steel..	3 plain..	Ball...	Ball...	1,800	32x3½	32x3½
Flanders 20	750	20.2	R'bout.	2	4	3⅛	3⅛	Block.	Tubular.	Cent'f'l..	Splitd'f..	Dry.....	Splash...	Cone....	Sel....	2	Axle...	Shaft...	100	‡56½	P. steel..	2 plain..	Ball...	Ball...	1,200	32x3	32x3
Franklin G	1850	18.2	Tour'g..	4	4	3⅜	4	Single.	Air cool..	.....	Bosch...	None....	Mech....	Disc.....	Prog..	3	Frame..	Shaft 2.	91½	53½	Wood...	5 plain..	Ball...	Roller.	.....	32x3½	32x4
Franklin D	2800	28.9	Tour'g..	5	4	4½	4	Single.	Air cool..	.....	Bosch...	None....	Mech....	Disc.....	Prog..	3	Frame..	Shaft 2.	106	53½	Wood...	5 plain..	Ball...	Roller.	.....	36x4	36x4½
Franklin K-4	3200	18.2	Land't..	5	4	3⅜	4	Single.	Air cool..	.....	Bosch...	None....	Mech....	Disc.....	Prog..	3	Frame..	Shaft 2.	100	53½	Wood...	5 plain..	Ball...	Roller.	.....	30x3½	30x4
Franklin H	3750	43.8	Tour'g..	7	6	4½	4	Single.	Air cool..	.....	Bosch...	None....	Mech....	Disc.....	Prog..	3	Frame..	Shaft 2.	127	53½	Wood...	7 plain..	Ball...	Roller.	.....	36x4½	37x5
Franklin D	4000	28.9	Land't..	7	4	4½	4	Single.	Air cool..	.....	Bosch...	None....	Mech....	Disc.....	Prog..	3	Frame..	Shaft 2.	114½	53½	Wood...	5 plain..	Ball...	Roller.	.....	34x4½	34x5
Haynes "19"	*2000	28.9	Tour'g..	5	4	4½	5	Pairs.	Cellular..	Gear....	Splitd'f..	Dry.....	Pump...	Con. b'd.	Sel....	3	Frame..	Shaft 2.	110	56	P. steel..	3 plain..	Roller.	Roller.	2,500	34x4	34x4
Hudson 20	1000	22.5	R'dster.	3	4	3¾	4½	Block.	Tubular.	Cent'f'l..	Extra...	Dry.....	Pump...	Cone....	Sel....	3	Frame..	Shaft...	100	56	P. steel..	3 plain..	Plain..	Roller.	1,700	32x3	32x3½
Hudson 20	1150	22.5	Tour'g..	5	4	3¾	4½	Block.	Tubular.	Cent'f'l..	Extra...	Dry.....	Pump...	Cone....	Sel....	3	Frame..	Shaft...	110	56	P. steel..	3 plain..	Plain..	Roller.	2,000	32x3½	32x3½
Knox R	*3250	40.0	Tour'g..	5	4	5	4½	Single.	Cellular..	Cent'f'l..	Bosch...	Storage..	Pump...	3-plate..	Sel....	3	Motor..	Shaft 2.	117	56	P. steel..	5 plain..	Ball...	Ball...	3,100	36x4½	36x4½
Knox S	*5000	60.0	Tour'g..	7	6	5	4½	Single.	Cellular..	Cent'f'l..	Bosch...	Storage..	Pump...	3-plate..	Sel....	3	Motor..	Shaft 2.	134	56	P. steel..	7 plain..	Ball...	Ball...	4,400	36x5	36x5
Locomobile I	3500	32.4	Tour'g..	5	4	4½	4½	Pairs.	H'comb..	Cent'f'l..	M. & b...	None....	3 mech..	Cone....	Sel....	4	Frame..	Shaft 2.	120	54	P. steel..	3 plain..	Ball...	Ball...	.....	34x4	34x4½
Locomobile I	4500	40.0	Tour'g..	7	4	5	6	Pairs.	H'comb..	Cent'f'l..	M. & b...	None....	3 mech..	Cone....	Sel....	4	Frame..	2-chain.	123	54	P. steel..	3 plain..	Ball...	Ball...	.....	36x4	36x5
Lozier J	3500	33.7	Tour'g..	5	6	3⅜	4½	Pairs.	H'comb..	Cent'f'l..	Bosch...	Storage..	3 mech..	Disc.....	Sel....	3	Frame..	Shaft 1.	116	55	P. steel..	4 ball...	Ball...	Ball...	2,900	36x4	34x4
Lozier H	5000	46.0	Tour'g..	7	4	5⅜	5½	Pairs.	H'comb..	Cent'f'l..	Bosch...	Storage..	2 mech..	Disc.....	Sel....	4	Frame..	Shaft 1.	124	56	P. steel..	3 ball...	Ball...	Ball...	3,500	36x4	36x5
Lozier I	6000	51.6	Tour'g..	7	6	4⅜	5½	Pairs.	H'comb..	Cent'f'l..	Bosch...	Storage..	3 mech..	Disc.....	Sel....	4	Frame..	Shaft 1.	131	56	P. steel..	4 ball...	Ball...	Ball...	3,700	36x4	36x5
Marion "10"	1850	28.9	Tour'g..	5	4	4½	4½	Pairs.	H'comb..	Cent'f'l..	Splitd'f..	Dry.....	Pump...	38-disc..	Sel....	3	Axle...	Shaft 1.	112	56	P. steel..	3 plain .	Roller.	Roller.	2,150	34x4	34x4
Matheson M	3000	48.6	Tour'g..	5	6	4½	5	Pairs.	H'comb..	Cent'f'l..	Bosch...	Battery.	Mech....	53-disc..	Sel....	3	Axle...	Shaft 1.	125½	56½	P. steel..	4 plain..	Ball...	Ball...	.....	36x4	36x4
Matheson E	5000	40.0	Tour'g..	7	4	5	6	Single.	H'comb..	Cent'f'l..	M. & B...	Dry.....	Mech....	Disc.....	Sel....	4	Frame..	2-chain.	128	56½	P. steel..	5 plain..	Ball...	Ball...	.....	36x4	36x5
Mercer A	1950	30.6	Tour'g..	5	4	4⅛	4½	Pairs.	Tubular.	Cent'f'l..	Bosch...	Dry.....	Pump...	Disc.....	Sel....	3	Frame..	Shaft 1.	116	56	P. steel..	3 plain..	.....	.....	.....	34x4	34x4
Oldsmobile	3000	36.1	Tour'g..	5	4	4⅛	4⅛	Pairs.	H'comb..	Cent'f'l..	Bosch...	Dry.....	Pump...	Cone....	Sel....	4	Frame..	Shaft...	118	56	P. steel..	3 plain..	Ball...	Roller.	.....	36x4	36x4
Oldsmobile	4600	54.1	R'bout.	2	6	4⅛	4⅛	Pairs.	H'comb..	Cent'f'l..	Bosch...	Dry.....	Pump...	Cone....	Sel....	4	Frame..	Shaft...	118	56	P. steel..	4 plain..	Ball...	Roller.	.....	42x4½	42x4½
Oldsmobile	4600	54.1	Tour'g..	7	6	4⅛	4½	Pairs.	H'comb..	Cent'f'l..	Bosch...	Dry.....	Pump...	Cone....	Sel....	4	Frame..	Shaft...	130	56	P. steel..	4 plain..	Ball...	Roller.	.....	42x4½	42x4½
Overland "38"	1000	22.5	R'bout.	2	4	3⅜	4½	Single.	Cellular..	None....	Remy...	Dry.....	Pump...	Plate....	Plan..	2	Axle...	Shaft 1.	102	56	P. steel..	5 plain..	Plain..	Roller.	1,850	32x3½	32x3½
Overland "40"	1250	28.9	R'bout.	3	4	4½	4½	Single.	Cellular..	None....	Remy...	Dry.....	Pump...	Plate....	Plan..	2	Axle...	Shaft 1.	112	56	P. steel..	5 plain..	Plain..	Roller.	2,100	34x3½	34x3½
Overland "41"	1400	28.9	Tour'g..	5	4	4½	4½	Single.	Cellular..	None....	Remy...	Dry.....	Pump...	Plate....	Plan..	2	Axle...	Shaft 1.	112	56	P. steel..	5 plain..	Plain..	Roller.	2,200	34x4	34x4
Overland "42"	1500	28.9	Tour'g..	5	4	4½	4½	Single.	Cellular..	None....	Remy...	Dry.....	Pump...	Cone....	Sel....	3	Frame..	Shaft 1.	112	56	P. steel..	5 plain..	Ball...	Roller.	2,200	34x4	34x4

*Price includes top. †Two-cycle motor. ‡Also 60 inches.

DETAILS OF CARS EXHIBITED AT 1910 MADISON SQUARE GARDEN SHOW—AMERICAN GASOLINE PLEASURE CARS—(Continued)

MAKE AND MODEL	Price	H.P.	BODY		MOTOR				COOLING		IGNITION		Lubrication	Clutch	TRANSMISSION				Wheelbase	Tread	Frame	BEARINGS			Weight	TIRES	
			Type	Seats	Cylinders	Bore	Stroke	Cyl. Cast	Radiator	Pump	Magneto	Battery			Type	Speeds	Location	Drive				Motor	Transmission	Axle		Front	Rear
Packard 18	3200	26.4	R'bout.	3	4	4 1/16	5½	Pairs.	H'comb.	Cent'f'l.	Eisem'n.	Storage.	2 mech.	Plate	Prog.	3	Axle	Shaft 2.	102	56½	P. steel	3 plain.	Ball	Roller.		34x3½	34x4
Packard 18	3200	26.4	Tour'g.	5	4	4 1/16	5½	Pairs.	H'comb.	Cent'f'l.	Eisem'n.	Storage.	2 mech.	Plate	Prog.	3	Axle	Shaft 2.	112	56½	P. steel	3 plain.	Ball	Roller.	2,750	34x4	34x4
Packard 30	4200	40.0	R'bout.	3	4	5	5½	Pairs.	H'comb.	Cent'f'l.	Eisem'n.	Storage.	2 mech.	Plate	Prog.	3	Axle	Shaft 2.	108	56½	P. steel	3 plain.	Ball	Roller.		36x3½	36x4½
Packard 30	4200	40.0	Tour'g.	7	4	5	5½	Pairs.	H'comb.	Cent'f'l.	Eisem'n.	Storage.	2 mech.	Plate	Prog.	3	Axle	Shaft 2.	123½	56½	P. steel	3 plain.	Ball	Roller.	3,300	36x4	36x4½
Palmer-S. XXX	2250	28.9	R'bout.	3	4	4½	4½	Pairs.	H'comb.	Cent'f'l.	Bosch	Battery	Pump	Disc	Sel.	4	Frame	Shaft	115	56	P. steel	3 plain.	Ball	Ball		34x4	34x4
Palmer-S. LXI	3250	54.1	R'bout.	3	6	4½	5½	Single.	H'comb.	Cent'f'l.	Bosch	Battery	Pump	Disc	Sel.	4	Frame	Shaft	127	56	P. steel	4 plain.	Ball	Ball		34x4	34x4
Palmer-S. LXII	3500	57.0	Tour'g.	5	6	4½	5½	Pairs.	H'comb.	Cent'f'l.	Bosch	Battery	Pump	Disc	Sel.	4	Frame	Shaft	127	56	P. steel	4 plain.	Ball	Ball		36x4	36x4½
Palmer-S. XXX	3650	28.9	Land't.	6	4	4½	4½	Pairs.	H'comb.	Cent'f'l.	Bosch	Battery	Pump	Disc	Sel.	4	Frame	Shaft	120	56	P. steel	3 plain.	Ball	Ball		34x4	34x4
Peerless "27"	4300	38.0	R'bout.	3	4	4½	5½	Pairs.	H'comb.	Gear	Bosch	Storage.	3 mech.	Ex. band	Sel.	4	Frame	Shaft 2.	118½	56	P. steel	3 plain.	Ball	Ball		36x4	36x5
Peerless "27"	4300	38.0	Tour'g.	7	4	4½	5½	Pairs.	H'comb.	Gear	Bosch	Storage.	3 mech.	Ex. band	Sel.	4	Frame	Shaft 2.	122	56	P. steel	3 plain.	Ball	Ball		36x4	36x5
Peerless "28"	6000	57.0	R'bout.	3	6	4½	5½	Pairs.	H'comb.	Gear	Bosch	Storage.	3 mech.	Ex. band	Sel.	4	Frame	Shaft 2.	132½	56	P. steel	4 plain.	Ball	Ball		36x4	36x5
Peerless "28"	6000	57.0	Tour'g.	7	6	4½	5½	Pairs.	H'comb.	Gear	Bosch	Storage.	3 mech.	Ex. band	Sel.	4	Frame	Shaft 2.	136	56	P. steel	4 plain.	Ball	Ball		36x4	36x5
Pierce-Arrow 36	3850	38.4	R'bout.	3	6	4	4½	Pairs.	H'comb	Cent'f'l.	Bosch	Storage.	Pump	Cone	Sel.	4	Frame	Shaft 2.	119	55	P. steel	4 plain.	Ball	Roller.		36x4	36x4
Pierce-Arrow 36	4000	38.4	Tour'g.	5	6	4	4½	Pairs.	H'comb.	Cent'f'l.	Bosch	Storage.	Pump	Cone	Sel.	4	Frame	Shaft 2.	125	55	P. steel	4 plain.	Ball	Roller.		36x4	36x4½
Pierce-Arrow 48	4850	48.6	R'bout.	3	6	4½	4½	Pairs.	H'comb.	Cent'f'l.	Bosch	Storage.	Pump	Cone	Sel.	4	Frame	Shaft 2.	128	56	P. steel	4 plain.	Ball	Roller.		36x4½	36x4½
Pierce-Arrow 48	5000	48.6	Tour'g.	7	6	4½	4½	Pairs.	H'comb.	Cent'f'l.	Bosch	Storage.	Pump	Cone	Sel.	4	Frame	Shaft 2.	134½	56	P. steel	4 plain.	Ball	Roller.		36x4½	37x5
Pierce-Arrow 66	5850	66.2	R'bout.	3	6	5½	5½	Pairs.	H'comb.	Cent'f'l.	Bosch	Storage.	Pump	Cone	Sel.	4	Frame	Shaft 2.	133½	56	P. steel	4 plain.	Ball	Roller.		37x5	37x5
Pierce-Arrow 66	6000	66.2	Tour'g.	7	6	5½	5½	Pairs.	H'comb.	Cent'f'l.	Bosch	Storage.	Pump	Cone	Sel.	4	Frame	Shaft 2.	140	56	P. steel	4 plain.	Ball	Roller.		37x5	38x5½
Pope-Hartford T	2750	29.7	Tour'g.	5	4	4 1/16	5½	Pairs.	Cellular.	Cent'f'l.	Extra	Storage.	4 mech.	Cone	Sel.	3	Frame	Shaft 2.	118	56	P. steel	3 plain.	Roller.	Roller.		36x4	36x4
Royal Tourist M	4500	48.4	Tour'g.	7	4	5½	6	Pairs.	H'comb.	Cent'f'l.	Magneto.	Storage.	Mech.	Cone	Sel.	4	Frame	Shaft 2.	126	56	P. steel	3 plain.	Ball	Roller		36x4½	36x5
Selden 35	2000	36.1	Tour'g.	5	4	4½	5	Pairs.	H'comb.	Cent'f'l.	Extra	Storage.	Pump	Cone	Sel.	3	Frame	Shaft 2.	116	56	P. steel	3 plain.	Roller.	Roller.	2,650	34x3½	34x4
Selden 29	3000	28.9	Limohs.	6	4	4½	4½	Pairs.	H'comb.	Cent'f'l.	Extra	Storage.	Pump	Cone	Sel.	3	Frame	Shaft 2.	114	56	P. steel	3 plain.	Roller.	Roller.		34x3½	34x4
Simplex 50	4450	53.0	Extra	...	4	5½	5½	Pairs.	H'comb.	Cent'f'l.	Bosch	None	Mech.	Disc	Sel.	4	Frame	2-chain.	124	56	P. steel	3p., 1 bl.	Ball	Ball	2,800	36x4	36x5
Simplex 50	4450	53.0	Extra	...	4	5½	5½	Pairs.	H'comb.	Cent'f'l.	Bosch	None	Mech.	Disc	Sel.	4	Frame	2-chain.	129	56	P. steel	3p., 1 bl.	Ball	Ball	2,850	36x4	36x5
Stearns 15-30	3200	32.4	Tour'g.	5	4	4½	4½	Pairs.	H'comb.	Cent'f'l.	Bosch	Dry	Pump	Disc	Sel.	3	Axle	Shaft 1.	116	56½	P. steel	3 ball	Ball	Ball	2,650	34x4	34x4
Stearns 30-60	4600	46.0	Tour'g.	7	4	5½	5½	Pairs.	H'comb.	Cent'f'l.	Bosch	Dry	Pump	25-disc	Sel.	4	Frame	Shaft 1.	124	56½	P. steel	3 ball	Ball	Ball	3,450	36x4	36x5
Stearns 30-60	4600	46.0	Tour'g.	7	4	5½	5½	Pairs.	H'comb.	Cent'f'l.	Bosch	Dry	Pump	25-disc	Sel.	4	Frame	2-chain.	124	56½	P. steel	3 ball	Ball	Ball	3,450	36x4	36x5
Stearns 45-90	6500	69.1	Tour'g.	7	6	5½	5½	Pairs.	H'comb.	Cent'f'l.	Bosch	Dry	Pump	Disc	Sel.	4	Frame	2-chain.	130	56½	P. steel	4 ball	Ball	Ball		36x4½	36x5
Stevens-Dur. XXX	2850	36.1	R'bout.	3	4	4½	4½	Pairs.	Cellular.	Cent'f'l.	Magneto.	Storage.	4 mech.	Plate	Prog.	3	Motor	Shaft 2.	109	56	P. steel	3 plain.	Ball	Ball		36x3½	36x4
Stevens-Dur. X	2850	36.1	Tour'g.	5	4	4½	4½	Pairs.	Cellular.	Cent'f'l.	Magneto.	Storage.	4 mech.	Plate	Prog.	3	Motor	Shaft 2.	124	56	P. steel	3 plain.	Ball	Ball		34x4	34x4
Stevens-Dur. AA	3300	43.8	Tour'g.	5	6	4½	4½	Pairs.	Cellular.	Cent'f'l.	Magneto.	Storage.	6 mech.	Plate	Prog.	3	Motor	Shaft 2.	128	56	P. steel	4 plain.	Ball	Ball	3,100	36x4½	36x4½
Stevens-Duryea Y	4000	54.1	Tour'g.	7	6	4½	4½	Pairs.	Cellular.	Cent'f'l.	Magneto.	Storage.	6 mech.	Plate	Prog.	3	Motor	Shaft 2	142	56	P. steel	4 plain.	Ball	Ball		36x4	36x5
Studebaker G-7	4000	36.1	Tour'g.	7	4	4½	5½	Pairs.	Tubular.	Cent'f'l.	Bosch	None	3 mech.	Cone	Sel.	4	Frame	Shaft 2.	117½	54	P. steel	3 plain.	Ball	Ball	3,000	36x4	36x4½
Thomas M	*3500	43.8	Tour'g.	5	6	4½	5½	Pairs.	H'comb.	Cent'f'l.	Bosch	Dry	9 mech.	3-plate	Sel.	3	Frame	Shaft 2.	125	56	P. steel	4 plain.	Ball	Roller.	3,650	36x4½	36x4½
Thomas R	4000	28.9	Limous.	6	4	4½	5½	Pairs.	H'comb.	Cent'f'l.	Bosch	Dry	Mech.	3-plate	Sel.	3	Frame	Shaft 2.	123	56	P. steel	3 plain.	Ball	Roller.	3,270	34x4½	34x4½
Thomas F	*4500	53.0	Tour'g.	7	4	5½	5½	Single.	H'comb.	Gear	Bosch	Dry	8 mech.	3-plate	Sel.	4	Frame	2-chain.	127	56	P. steel	5 plain.	Ball	Ball	3,525	36x4½	36x5
Thomas K	*6000	72.6	Tour'g.	7	6	5½	5½	Single.	H'comb.	Gear	Bosch	Dry	10 mech.	3-plate	Sel.	4	Frame	2-chain.	140	56	P. steel	7 plain.	Ball	Ball	4,160	36x4½	36x5
White G-A	2000	22.5	Tour'g.	5	4	3½	5½	Block.	H'comb.	Cent'f'l.	Bosch	None	Pump	Cone	Sel.	4	Frame	Shaft 2.	110	56½	P. steel	2 ball	Ball	Ball		32x4	32x4
White G-B	2500	22.5	Tour'g.	5	4	3½	5½	Block.	H'comb.	Cent'f'l.	Bosch	None	Pump	Cone	Sel.	4	Frame	Shaft 2.	120	56½	P. steel	2 ball	Ball	Ball		34x4	34x4
Winton 48	3000	48.6	Tour'g.	5	6	4½	5	Pairs.	Tubular.	Cent'f'l.	Eisem'n.	Storage.	Pump	67-disc.	Sel.	4	Frame	Shaft 2.	124	56½	P. steel	4 plain.	Ball	Roller.		34x4	34x4½
Winton 60	4250	60.0	Tour'g.	7	6	5	5	Pairs.	Tubular.	Cent'f'l.	Eisem'n.	Storage.	Pump	67-disc.	Sel.	4	Frame	Shaft 2.	130	56½	P. steel	4 plain.	Ball	Roller.		36x4	36x4½

STEAM PLEASURE CARS

MAKE AND MODEL	Price	BODY		ENGINE							Boiler	Condenser	TRANSMISSION			Wheelbase	Tread	Frame	BEARINGS			Weight	TIRES	
		Type	Seats	No. Cyls.	Type	Action	Bore	Stroke	Valves	Position			Change-Gear	Speeds	Drive				Engine	Transmission	Axle		Front	Rear
White O-O	$2000	Touring	5	2	Compound.	Double.	2½ & 4½	3	Joy	Front.	Flash.	Yes	Sliding	2	Shaft 2.	110	56	P. steel	Ball	Ball	Ball	2,300	32x4	32x4
White M-M	4000	Touring	7	2	Compound.	Double.	3 & 5	4½	Joy	Front.	Flash.	Yes	Sliding	2	Shaft 2.	122	56	P. steel	Ball	Ball	Ball	3,600	36x4	36x5

*Price includes top. †Two-cycle motor. ‡Also 60 inches.

• THE • A • L • A • M • SHOW •

DETAILS OF CARS EXHIBITED AT 1910 MADISON SQUARE GARDEN SHOW—GASOLINE COMMERCIAL CARS

MAKE AND MODEL	Price	H.P.	BODY		MOTOR				COOLING		IGNITION		Lubrication	Clutch	TRANSMISSION				Wheelbase	Tread	Frame	BEARINGS			Weight	TIRES (Solid)	
			Type	Tons	Cylinders	Bore	Stroke	Cyl. Cast	Radiator	Pump	Magneto	Battery			Type	Speeds	Location	Drive				Motor	Transmission	Axle		Front	Rear
Alco 16	3350	24.8	Taxic'b	...	4	100	120	Pairs.	Cellular.	Cent'f'l.	Bosch	None	Mech.	Disc.	Sel.	3	Frame.	Shaft 2.	104	55½	P. steel.	3 plain.	Ball.	Ball.	.....	32x4	32x4
Alco Truck	3500	24.8	Truck.	3	4	100	120	Pairs.	Tubular.	Cent'f'l.	Bosch	None	Mech.	Disc.	Sel.	3	Frame.	2-chain.	110	65	I-beam.	3 plain.	Ball.	.....	.....	36x5	36x3½d
Alden Sampson	4500	40.0	Truck.	4	4	5	5½	Pairs.	Tubular.	None.	Bosch	Dry.	3 mech.	Cone.	Sel.	4	Frame.	2-chain.	148	68	Channel.	3 plain.	Ball.	Plain.	8,200	36x5	36x5d
Alden Sampson	5000	40.0	Truck.	5	4	5	5½	Pairs.	Tubular.	None.	Bosch	Dry.	3 mech.	Cone.	Sel.	4	Frame.	2-chain.	155	68	Channel.	3 plain.	Ball.	Plain.	9,000	36x6	42x6d
Autocar XXI	2300	18.0	Exp.	1½	2	4½	4½	Single.	Tubular.	Cent'f'l.	Magneto.	Battery.	Mech.	3-plate.	Prog.	3	Frame.	Shaft 2.	97	58	P. steel.	2 plain.	Roller.	Roller.	.....	34x3½	34x4
Elmore 36	2500	†	Taxic'b	...	4	4½	4	Single.	Tubular.	None.	None	Dry.	6 mech.	Con. b'd.	Sel.	3	Frame.	Shaft.	110	56	P. steel.	5 plain.	Ball.	Roller.	.....	34x4	34x4
Franklin L-1	2000	18.2	Extra.	½	4	3⅜	4	Single.	Air cool.	.....	Bosch	None	Mech.	Disc.	Prog.	3	Frame.	Shaft 2.	83	53½	Wood	5 plain.	Ball.	Roller.	1,750	32x2½	32x3
Franklin L-2	2200	18.2	Extra.	1	4	3⅜	4	Single.	Air cool.	.....	Bosch	None	Mech.	Disc.	Prog.	3	Frame.	Shaft 2.	83	53½	Wood	5 plain.	Ball.	Roller.	1,850	32x3	32x3½
Franklin J-3	2500	18.2	Extra.	2	4	3⅜	4	Single.	Air cool.	.....	Bosch	None	Mech.	Disc.	Prog.	3	Frame.	Shaft 2.	100	53½	Wood	5 plain.	Ball.	Roller.	2,550	32x3	32x3d
Hewitt	3000	24.2	Truck.	2	2	5½	5	Single.	Cellular.	Cent'f'l.	Magneto.	Battery.	Mech.	Cone.	Plan.	2	Frame.	2-chain.	112	60	Channel.	2 plain.	Plain.	Plain.	.....	34x4	34x3½d
Hewitt	5250	28.9	Truck.	5	4	4½	5½	Pairs.	Cellular.	Cent'f'l.	Magneto.	Battery.	Mech.	Cone.	Plan.	2	Frame.	2-chain.	140	68	Channel.	3 plain.	Plain.	Plain.	.....	36x4d	36x5d
Knox	1400	10.0	Extra.	⅜	1	5	7	Single.	Air cool.	.....	None.	Dry.	3 mech.	Plate.	Plan.	2	Frame.	2-chain.	85	56	Angle.	2 plain.	Plain.	Roller.	1,800	32x3	36x3
Knox	2200	20.0	Extra.	1½	2	5	6	Single.	Air cool.	.....	None.	Dry.	6 mech.	Plate.	Plan.	2	Frame.	2-chain.	97	56	Angle.	2 plain.	Plain.	Roller.	2,100	32x3½	32x3½
Knox	2600	20.0	Extra.	1½	2	5	6	Single.	Air cool.	.....	None.	Dry.	6 mech.	Plate.	Plan.	2	Frame.	2-chain.	100	56	Angle.	2 plain.	Plain.	Roller.	3,260	34x3½	34x4
Knox	3500	40.0	Extra.	2	4	5	4⅜	Single.	Cellular.	Cent'f'l.	Bosch	Storage.	Pump.	3-plate.	Sel.	3	Frame.	2-chain.	125	60‡	Channel.	5 plain.	Ball.	Roller.	4,200	34x4	34x5
Knox	3750	40.0	Extra.	3	4	5	4⅜	Single.	Cellular.	Cent'f'l.	Bosch	Storage.	Pump.	3-plate.	Sel.	3	Frame.	2-chain.	149	67	Channel.	5 plain.	Ball.	Roller.	5,100	36x4	36x3½d
Knox	4000	48.4	Extra.	4	4	5½	5½	Single.	Cellular.	Cent'f'l.	Bosch	Storage.	Pump.	3-plate.	Sel.	3	Frame.	2-chain.	154	67	Channel.	5 plain.	Ball.	Roller.	5,400	36x4	36x4d
Knox	4300	48.4	Extra.	5	4	5½	5½	Single.	Cellular.	Cent'f'l.	Bosch	Storage.	Pump.	3-plate.	Sel.	3	Frame.	2-chain.	154	67	Channel.	5 plain.	Ball.	Roller.	5,600	36x5	36x4d
Packard	3400	32.4	Extra.	3	4	4½	5½	Pairs.	Cellular.	Cent'f'l.	Eisem'n.	Storage.	2 mech.	Plate.	Prog.	3	Frame.	2-chain.	144	68	Channel.	3 plain.	Ball.	Roller.	5,200	34x4	36x4d
Packard	3400	32.4	Extra.	3	4	4½	5½	Pairs.	Cellular.	Cent'f'l.	Eisem'n.	Storage.	2 mech.	Plate.	Prog.	3	Frame.	2-chain.	172	68	Channel.	3 plain.	Ball.	Roller.	5,750	34x4	36x4d
Pope-Hartford	.....	29.7	.....	...	4	4 7/16	5½	Pairs.	Cellular.	Cent'f'l.	Extra	Storage.	4 mech.	Cone.	Sel.	3	Frame.	Shaft.	130	56	P. steel.	3 plain.	Roller.	Roller.	.....	34x5x	34x5x
White	.....	22.5	Extra.	1½	4	3¾	5½	Block.	H'comb.	Cent'f'l.	Bosch	None	Pump	Cone.	Sel.	4	Frame.	Shaft 2.	144	60	P. steel.	2 ball.	Ball.	Roller.	.....	36x4x	36x4dx

ELECTRIC PLEASURE CARS

MAKE AND MODEL	Price	BODY		MOTOR			BATTERIES			SPEEDS		First Reduction	Drive	Wheelbase	Tread	Frame	BEARINGS			Weight	TIRES	
		Type	Seats	Number	H.P.	Location	Type	No. Cells	Location	Forward	Reverse						Motor	Transmission	Axle		Front	Rear
Baker	$2000	Runabout	2	One.	2	Middle.	Exide 11PV.	30	Divided.	6	3	Silent chain.	Bevel gears.	80	50	Steel	Ball.	Ball.	Ball.	1,900	32x3½	32x3½
Baker	2000	Victoria	2	One.	2	Middle.	Exide 9 MV.	28	Divided.	6	3	Silent chain.	Bevel gears.	80	50	Steel	Ball.	Ball.	Ball.	1,950	32x3½	32x3½
Baker	2400	Coupe	2	One.	2	Middle.	Exide 9 MV.	28	Divided.	6	3	Silent chain.	Bevel gears.	80	50	Steel	Ball.	Ball.	Ball.	2,100	32x3½	32x3½
Baker	2600	Coupe	4	One.	2	Middle.	Exide 9 MV.	28	Divided.	6	3	Silent chain.	Bevel gears.	80	50	Steel	Ball.	Ball.	Ball.	2,200	32x3½	32x3½
Columbia	1600	Victoria	2	One.	3½	Rear.	Exide 13 PV.	24	Divided.	6	3	H'bone gears.	Single chain.	70	48	None	Ball.	Ball.	Ball.	1,650	30x3½	30x3½
Detroit H	1650	Roadster	3	One.	3	Axle.	Option 13MV.	24	Divided.	5	3	Silent chain.	Single Chain.	87	51	Angle	Ball.	Ball.	Roller.	1,900	32x3½	32x3½
Detroit A	1900	Victoria	2	One.	3	Middle.	Option 13MV.	24	Divided.	5	3	Silent chain.	Double chain.	80	51	Channel	Ball.	Ball.	Roller.	2,100	32x3½	32x3½
Detroit E	2100	Coupe	2	One.	3	Axle.	Option 13MV.	24	Divided.	5	3	Silent chain.	Single chain.	87	51	Angle	Ball.	Ball.	Roller.	2,300	32x3½	32x3½
Detroit C	2350	Coupe	2	One.	3	Middle.	Option 13MV.	24	Divided.	5	3	Silent chain.	Double chain.	80	51	Channel	Ball.	Ball.	Roller.	2,300	32x3½	32x3½
Detroit D	2500	Brougham	4	One.	3	Middle.	Option 13MV.	24	Divided.	5	3	Silent chain.	Double chain.	80	51	Channel	Ball.	Ball.	Roller.	2,400	32x3½	32x3½
Rauch & Lang 20	1900	Stanhope	2	One.	2½	Middle.	Exide 9 MV.	24	Divided.	6	3	Silent chain.	Double chain.	77	53	P. steel	Ball.	Ball.	Roller.	1,975	32x3½	32x3½
Rauch & Lang 22	2100	Stanhope	3	One.	2½	Middle.	Exide 11 MV.	24	Divided.	6	3	Silent chain.	Double chain.	77	53	P. steel	Ball.	Ball.	Roller.	2,125	32x3½	32x3½
Rauch & Lang 133	2100	Runabout	2	One.	2½	Middle.	Exide 11 PV.	30	Divided.	6	3	Silent chain.	Double chain.	85	53	P. steel	Ball.	Ball.	Roller.	2,050	32x3½	32x3½
Rauch & Lang 23	2200	Victoria	4	One.	2½	Middle.	Exide 11MV.	24	Divided.	6	3	Silent chain.	Double chain.	85	53	P. steel	Ball.	Ball.	Roller.	2,100	32x3½	32x3½
Rauch & Lang 24	2700	Coupe	4	One.	2½	Middle.	Exide 13 MV.	24	Divided.	6	3	Silent chain.	Double chain.	85	53	P. steel	Ball.	Ball.	Roller.	2,550	32x4	32x4
Waverley 69	1225	Runabout	2	One.	....	Axle.	Option 9.	30	Divided.	4	4	H'bone gear.	H'bone gear.	72	54	Armored	Ball.	Ball.	Roller.	.....	32x3	32x3½
Waverley 74	1600	Stanhope	2	One.	....	Rear.	Option 11.	30	Divided.	4	4	H'bone gear.	H'bone gear.	73½	54	Armored	Ball.	Ball.	Roller.	.....	32x3	32x3½
Waverley 78	1700	Roadster	2	One.	....	Rear.	Option 11.	32	Divided.	4	4	H'bone gear.	H'bone gear.	94	54	Armored	Ball.	Ball.	Roller.	.....	32x3½	32x3½
Waverley 60	1900	Surrey	4	One.	....	Axle.	Option 13.	35	Divided.	4	4	H'bone gear.	Spur gears.	91	54	Armored	Ball.	Ball.	Roller.	.....	32x3½	32x3½
Waverley 70C	2000	Coupe	2	One.	....	Rear.	Option 11.	30	Divided.	4	4	H'bone gear.	H'bone gear.	79	54	Armored	Ball.	Ball.	Roller.	.....	32x3	32x3½
Waverley 75C	2250	Brougham	4	One.	....	Rear.	Option 13.	32	Divided.	4	4	H'bone gear.	H'bone gear.	79	54	Armored	Ball.	Ball.	Roller.	.....	32x3½	32x3½
Woods	2100	Victoria	2	One.	....	Middle.	Exide 9 MV.	40	Divided.	4	4	H'bone gear.	Double chain.	74	56	Bronze	Ball.	Ball.	Ball.	2,650	30x3½	34x3½
Woods	2650	Brougham	4	One.	....	Middle.	Exide 9 MV.	40	Divided.	4	4	H'bone gear.	Double chain.	74	56	Bronze	Ball.	Ball.	Ball.	2,850	30x3½	34x3½

*Price includes top. †Two-cycle motor. ‡Also 60 inches. x Pneumatic tires

· SAID · IN · THE · SELLING ·

ALCO: Arthur N. Jervis, Advertising Manager—For 1910 this company offers a complete line of cars, which, in details of design, materials and workmanship, are unsurpassed. The reasons why a man should buy one of these cars in preference to some other car selling at the same or a different price are as follows:

The double chain drive, also the make-and-break system of ignition, has been discontinued, and all pleasure cars will be made with a shaft drive and a jump spark ignition, the Bosch dual system of high-tension magneto and storage batteries, with one set of spark plugs, being employed. These are the chief changes; they are in conformance with the policy of the company to Americanize the French design of the Alco in order to meet the prevailing demand. The company emphasizes the fact, however, that never is any change made until after it is certain that the quality and all the distinctive character can be maintained.

It is noteworthy in this connection that the shaft drive and floating rear axle construction adopted for all the 1910 cars is no experiment, but an original Alco design that was first introduced on the Alco town car in March, 1907. Since then it has become widely known and been much copied.

Most of the excellent features have been retained, and each one of these is a reason for buying in itself. The special design of rear axle of the full floating type, the French type of engine, Americanized, the anti-fatigue steel used throughout the car regardless of cost, the unusually large and powerful brakes, the deep, square tube radiator, and other features which space prevents the mention of, are all mute but eloquent arguments in favor of the Alco car.

APPERSON: George H. Strout, Sales Manager—To the prospective purchaser of an automobile, the dealer in Apperson cars usually points out that the Apperson Bros. have been constantly building high-grade automobiles for over sixteen years; that no maker in America, and few, if any, in Europe, have had more years of experience in this line of manufacture. Experience is the best teacher, and it has taught Apperson Bros. how to build motor cars that are in no way surpassed in efficiency by any other make of car.

Since every component part of an Apperson car is designed and built throughout in the Apperson factory, the resulting product is a well balanced, homogeneous motor car, built from the best materials the world's markets produce.

All working Apperson parts are made from metals especially selected for the use for which they are to be put, and the parts that bear the greatest strain are treated and tempered in the Apperson factory by a secret process known only to the Apperson Bros.

BUICK: A. G. Southworth, Manager, New York Branch—The aim of the Buick Motor Company is to produce "for the price asked" better cars than any other maker; to give every buyer a square deal, and so make every Buick owner a Buick advertiser. The sale of 18,000 cars in 1909 proves that they have hit the mark.

A Buick car is the best possible automobile investment, because it is backed by a strong company that makes, with few exceptions, everything that enters into the car. They are sold in every civilized country; you can get a part or find a mechanic that knows the car in every hamlet. Their commercial value is proven by the fact that 32,000 are running to-day; few are offered second-hand, and they bring a better percentage of the original price than any other automobile—barring none.

We feature points that have quickly placed Buicks at the head of the motor car procession, viz.: simple, standard construction, overhead valves, self-contained oiling system with circulating pump, and full elliptic rear springs. Silence, ease of operation, economy of upkeep, accessibility of parts and completeness of equipment are combined to a degree seldom found in other cars, while in comfort, design, finish and riding qualities, in which so many cars are deficient, they surpass all other medium-price cars.

Regardless of price, horsepower or number of cylinders, Buick stock cars have won more important stock car races and made more world's stock car records in 1909 than all other cars combined.

We issued through the press a fair challenge. It was never answered. A demonstration in a Buick will show you why.

Hundreds of Buick cars are in daily use that have run over 60,000 miles. Three Buicks purchased three and a half years ago to carry U. S. mail between Torrance and Roswell, N. M., have run 110,000 miles each, covering 110 miles a day on an average of 300 days a year—they are still in active service, with the probability that they will round out five years in Uncle Sam's employment.

Buick customers are satisfied automobile owners. Buick reputation is established; we are not experimenting at your expense. Ask your neighbor—he has one.

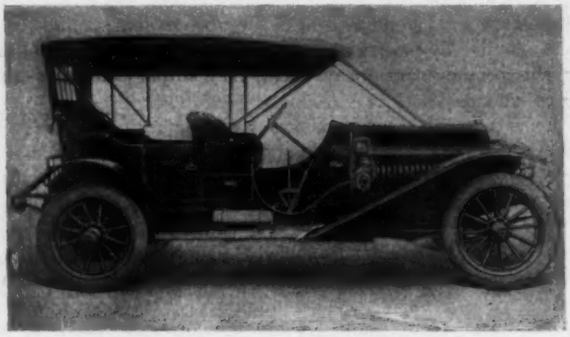
CADILLAC: W. C. Leland, General Manager—In a car having a carrying capacity for five passengers or less, the Cadillac "Thirty" is beyond question the most judicious purchase, because it offers greater value than any car made, regardless of price.

The construction of the Cadillac "Thirty" has for its foundation a half-century's experience in the manufacture of the finest machinery and machine tools. Its materials are selected only after the most careful analysis of the duties they must perform. The workmanship is of the highest type. It is manufactured according to designs, methods, principles and practice which the Cadillac Company has followed for seven years, and which have proven themselves to be as near correct as engineering science has been able to accomplish.

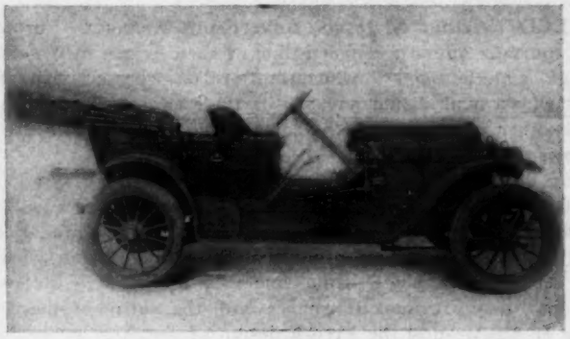
As proof of this statement I may simply point to the all significant fact that there are now approximately thirty thousand cars in use throughout the world. We have yet to hear of a single one which has been discarded because of being worn out or unfit for use, although the first year's output, some two thousand cars, made in 1903, has seen seven years' constant service. I believe that the desideratum of the great majority of automobile buyers is: service, reasonable speed, ample power for reasonable requirements, comfort (both mental and physical), absence of "automobile troubles," dependability and economy. I believe that he gets these to a greater extent in the Cadillac "Thirty" at $1,600 than in any other car at any price.

COLUMBIA: H. W. Nuckols, General Manager—Refinement of detail of design, I believe, first distinguishes the Columbia four-cylinder gasoline car for 1910. With the model first evolved in 1906 there has been opportunity to raise each unit of construction to a very high place and for the year at hand the new car will first interest veteran motorists for a number of little niceties which have been incorporated. Friends have said that it contains more clever features than any car of current building, and I believe it to be true. Also, I think it fair to state that no new car in its first or second year could have been worked out to a state of such high efficiency.

We are building the car as well as Columbias have been built in the past, which means to a fine point of machining accuracy. Further we are provided with a higher quality of raw material than the market has ever previously held. These and what seems to be a fortunate selection of body styles have made for a strong interest in the car. It is most flattering. We are appreciative. It has all along been said that Columbia cars have led in each year but it is patent that the leadership was never so marked as during the present season. Our roadster design merits the praise of being generously copied.



Alco Six-Cylinder Toy Tonneau



Apperson Jack Rabbit Speed Car

Also interest has been exhibited in our new electric, a two-passenger landaulet, for open or closed driving. Changes in electrics are few, which may account for the interest manifested, but further than this, this new landaulet provides, in one vehicle, a carriage for all sorts of weather for shopping, calling, and city and town driving. Our production was at hand fairly early this season, has enjoyed a large sale, and we are making deliveries according to schedule.

CORBIN: L. Goss—Everyone should buy a Corbin car because of the fact that a car is no better than its poorest and weakest part. This matter is governed solely by the standing and backing, which a firm has, since this (if very good) allows the company to make every component part in its own shops. Beyond the ability to do so, the worth of a car lies in the number and character of the component parts actually made under the one factory roof.

The Corbin Motor Vehicle Corporation, of New Britain, Conn., is one of the very few concerns in the automobile industry that designs and manufactures the parts that enter into the makeup of their car. Without an exception, the only parts that this concern is not responsible for are the twenty-two imported annular ball bearings, which are manufactured by Fichtel & Sachs, of Germany. The reason for using these bearings needs no explanation, for it is a well-known fact that these bearings are the best the world affords.

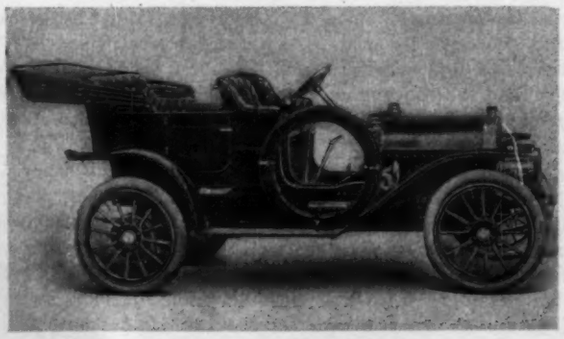
It is not a surprising fact that the Corbin car has reached such a high state of perfection, when you consider the facilities and backing the car has had. The Corbin Motor Vehicle Corporation is one of the leading companies forming the American Hardware Corporation, the other members being P. & F. Corbin Company, Russell & Erwin Manufacturing Company, Corbin Screw Corporation and the Corbin Cabinet Lock Company. Take the combined energies of these concerns and any manufacturing scheme is sure to be successful and will uphold the name "Corbin" the world over. The Corbin car is no exception to this. Starting in a small way, then increasing their production, and still holding to the same general ideas, making changes to the extent of refinements until the Corbin is now considered "The Perfect Car."

ELMORE: Theodore F. McManus, Advertising Department—Speaking of the reasons why a man should buy an Elmore automobile, perhaps the simplest and shortest answer that could be given to this question is contained in the statement that the Elmore represents the only perfect type of the valveless two-cycle engine in existence.

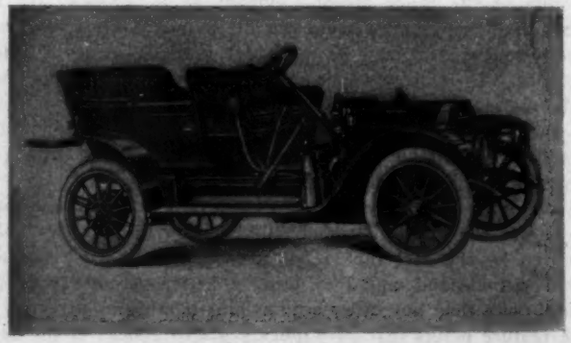
Our devotion to the principles embodied in the Elmore valveless two-cycle engine leads us to believe that if this engine were universally understood, that the public would decline to accept any other type.

We believe that the Elmore valveless two-cycle engine is the most perfect engine in the world, because it is the simplest engine and because it furnishes that quality of operation to be desired above all others, to wit: an unbroken and continuous flow of power.

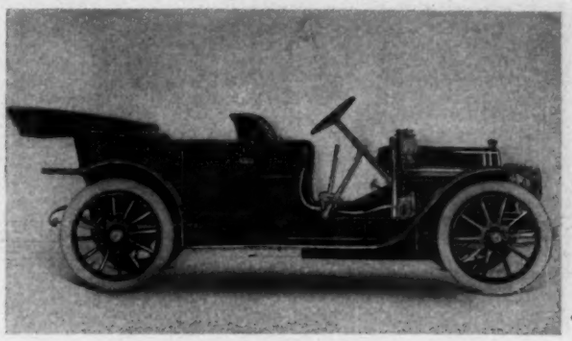
The four-cycle engine, in its very highest development, cannot escape the evil consequences of an intermittent application of power, because that evil is inherent in the four-cycle principle itself, and therefore, all four-cycle engines must incorporate it.



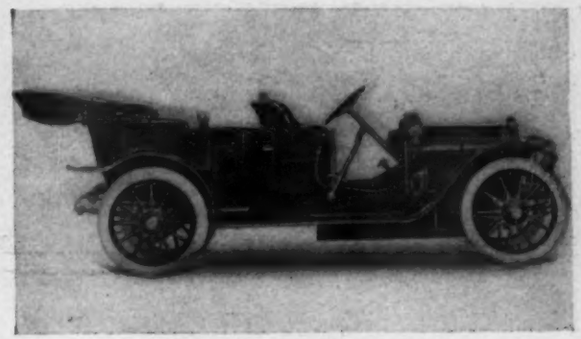
Autocar Type XXII Touring Car



Buick Model 19 Touring Car



Chalmers-Detroit "30" Touring Car



Chalmers-Detroit "40" Touring Car

We believe that the universal acceptance of the principle incorporated in the Elmore valveless two-cycle engine is simply being delayed.

The tremendous impetus that it has acquired in the past five years is being steadily increased.

Manufacturers of six-cylinder cars are filling the public prints with admissions of the inadequacy of the single and four-cylinder four-cycle engines. They justly say that the single-cylinder four-cycle jerks itself alone, and that the four-cylinder four-cycle only differs from the single cylinder, in that it has four times as many jerks.

They announce the change to the six cylinder as a cure for the evil. The error of intermittent power, however, is not in the numbers of cylinders, but in the four-cycle principle itself.

Elmore owners could not be persuaded to exchange the superiorities and advantages of their car for the disadvantages of the four-cycle type, no matter what inducement might be made to them in the matter of price.

As this knowledge spreads—as individual after individual learns that in the Elmore, and in the Elmore only, can he secure the smooth, even, economical operation resultant from the continuous application of power——the abandonment of the four-cycle engine and the adoption of the Elmore valveless two-cycle engine will be multiplied in hundreds and hundreds of cases.

The past eight years have recorded a steadily increasing conversion to the Elmore valveless two-cycle idea, with which it has been manifestly impossible for even our large and constantly increased equipment to keep pace.

We believe that every man should own an Elmore, because of its valveless two-cycle engine; because it has the simplest motor in the world; because it costs less to keep and maintain than any other car in the world; because it has a motor that never wears out, and runs better after a year's use than when it is new; because this motor starts from the seat oftener than any other; because it has the most economical of all ignition systems, and last, but not least, because the even, rhythmic motion, which results from a continuous application of power, insures a saving on tires, which cannot be paralleled by any car of the four-cycle type.

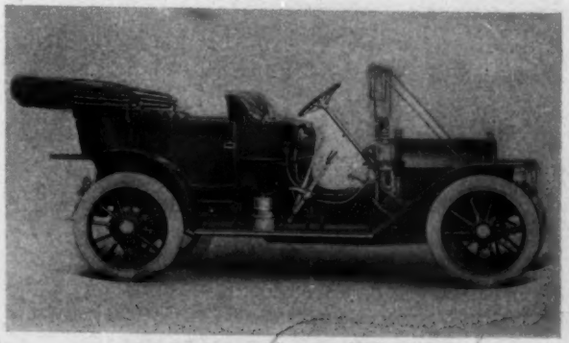
FRANKLIN: Sales Department, H. H. Franklin Mfg. Co.—The purchaser of a Franklin motor car buys riding comfort, road ability, and long service, and he gets an air-cooled motor that is free from the troubles which are common with water-cooled engines. In these two facts center the reasons why a buyer will find it to his advantage to secure a Franklin.

He must first make sure of easy riding, and that is an inevitable accompaniment of light weight, which in the Franklin is effected by consistent construction methods throughout the automobile. Strength and quality are secured without bulk.

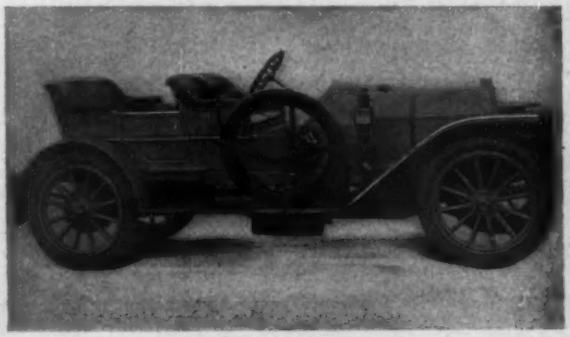
The Franklin is built throughout with a view to absorbing road shocks instead of transmitting them to the passengers. The cushioning effect starts with large tires and large wheels, and is augmented by the use of full-elliptic springs and a laminated-wood chassis frame.

The tires are specially large for the weight which they carry, and this results in greatly prolonging the life of the tires.

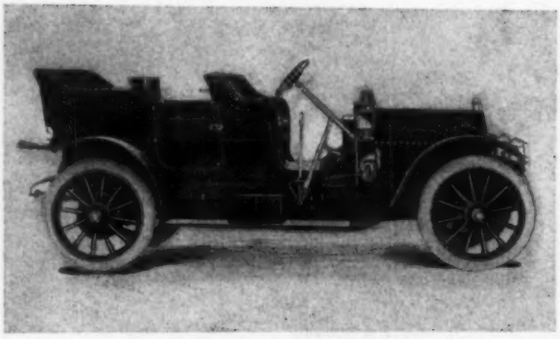
This construction keeps the occupants of the motor car from feeling the jolts of travel, which, in view of the light weight



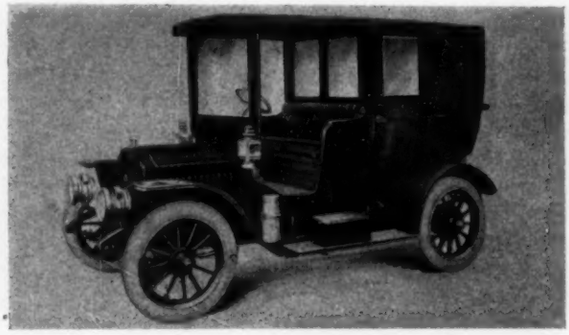
Cadillac "30" Four-Cylinder Touring



Columbia Model 29 Toy Tonneau



Elmore Model 46 Touring Car



Elmore Model 36 Landaulet

of the Franklin, are much less of themselves than are the jolts made with a heavy, hard-riding, steel-frame automobile.

It is the judgment of many automobilists that three-fourths of the trouble with the average motor is due to the cooling system. In hot weather, the water-cooled engine has a tendency to boil dry and in winter to freeze and burst the water pipes and connections.

With the Franklin air-cooled motor none of this is possible. There is no water to either freeze or boil dry. Like the rest of the automobile, the motor is light and simple. Unnecessary parts are eliminated, and the engine is reduced to the minimum of what is essential for efficient power production.

The buyer of a Franklin secures a comfortable, easy riding, efficient motor car. In body design and appearance, it is all that a high-grade automobile should be. The sheet-aluminum panels of which the body is made are so fashioned as to produce a grace and beauty in harmony with the construction merits of the motor-car.

KNOX: Knox Automobile Company—For the season of 1910 we offer a line of models and types that are unsurpassed. They are designed and equipped to meet the approval of a most exacting public and we have every confidence in their mechanical perfection.

Our aim has been to produce strictly high grade motor cars embodying the most advanced ideas in material and methods of manufacture.

Knox water cooled motors have, ever since their introduction in 1907, proved their superibrity over all makes, whether foreign or American. Having this, the most important factor toward the perfect motor car, we have endeavored in every way, regardless of cost of material or expense, to bring every detail beyond a point of criticism, either from a mechanical or selling standpoint. Every part of the construction in Knox models receives months of abuse in actual service before it is considered worthy of adoption.

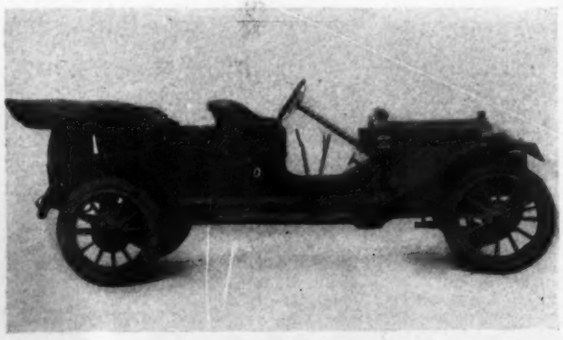
We include three models for 1910: Model "R," four-cylinder, 40-horsepower; Model "M," four-cylinder, 48-horsepower; Model "S," six-cylinder, 60-horsepower.

All have the same general design and construction and all the different types are up-to-date and fully equipped at their selling prices. The quality of material, finish and equipment is of the same high order, whether a Model "R" selling at $3,250 or a Model "S" Limousine at $6,000, quality has been first considered.

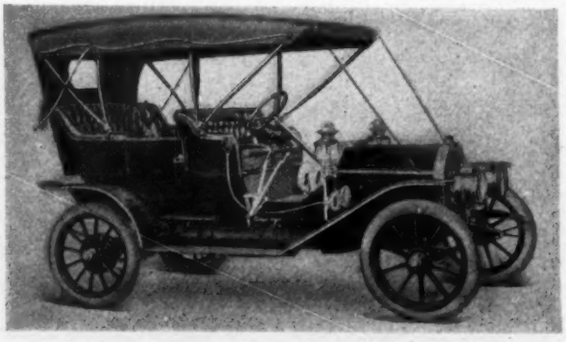
A careful study of Knox construction and a comparison of ability, quietness, accessibility, easy riding, and all that goes to make the up-to-date high grade motor car will easily prove Knox superiority.

LOZIER: C. A. Emise, Publicity Department—The prospective purchaser of an automobile who will study the trend of design in automobiles will be convinced, after an examination of the Lozier, that this car will suit his purposes as well, if not better than any other large high-powered car on the market, and for the following reasons:

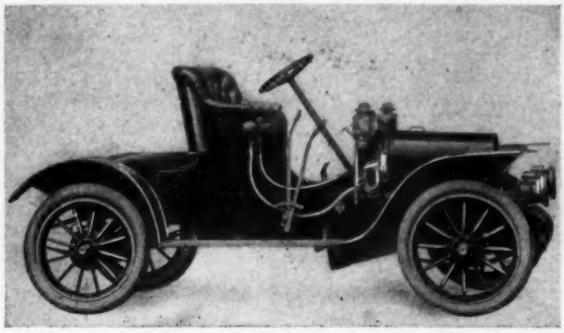
He will find on investigation and by comparison that no desirable improvement as exemplified on other cars is found wanting in the Lozier. A few years ago many features on cars (which features are now recognized as standard) were in dis-



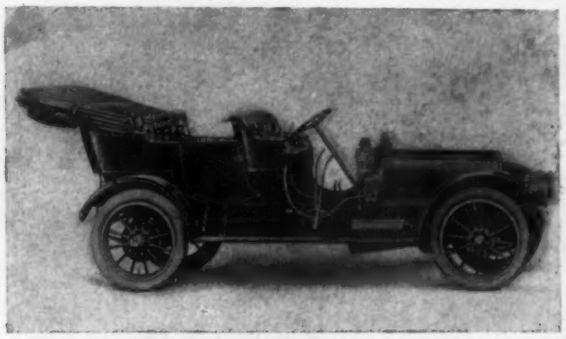
Corbin Four-Cylinder Toy Tonneau



E-M-F "30" Four-Cylinder Touring



Franklin Model G Four-Cylinder Runabout



Franklin Model H Six-Cylinder Touring

pute. For instance, there was discussion as to the relative merits of the progressive or selective type transmission; large or small wheels; long or short wheelbase; ball bearings or plain bearings; low-tension or high-tension ignition; magneto or storage battery ignition; automatic valves vs. mechanically actuated valves. Most of these questions have been definitely settled, and in every instance it will be found that the Lozier has been on the winning side, the features adopted as standard having been incorporated from the first in the Lozier models.

At the present time there are still differences in constructive features of various cars regarding the respective merits of which there is dispute, but with the record of having always been right, it is reasonable to presume that the construction advocated by the Lozier will in the future again prove to be correct. These features refer to ball bearings in the motor, multiple disc clutch, full floating type of rear axle, method of spring suspension, oil systems, narrow turning radius, elimination of numerous universal joints, etc., together with numerous minor points, lack of which might occasion troubles and difficulties which heretofore have been looked upon as necessary.

Among these latter details might be mentioned accessibility of gasoline strainer, accessible position of all oilers and oiling points, accessible adjustments of mechanism, demountable rims, electric lamps, dustless bodies, protection against mud splash and other details of this kind which many designers and purchasers overlook, but which if taken into consideration by the manufacturer assist greatly in the perfect satisfaction which it is possible for a car to afford its owner, and which every one should.

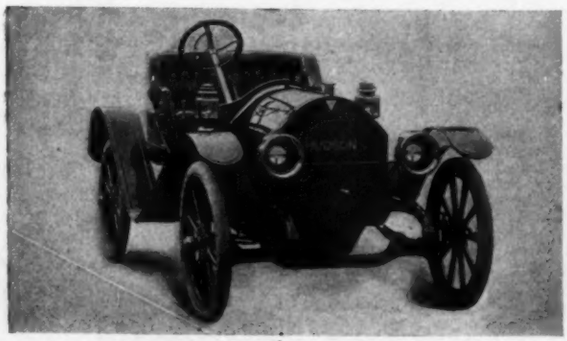
No purchaser of an automobile can possibly find the time to investigate in detail every automobile, and therefore the car and maker enjoying the reputation of never having made a serious mistake in design, construction, or the selection of material should inspire the confidence that impels the selection of that car in preference to the car that has been right some of the time but wrong occasionally, or at best has only adopted improvements a year or two after they have become accepted features of other cars.

The name "Lozier" is a name that counts for something.

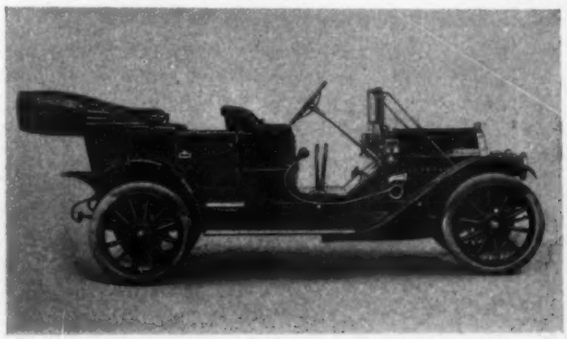
Of course, a car may be perfectly designed and embody practically every desirable constructive feature, but be lacking in strength and durability. There can be no question in the mind of any fair-minded person regarding the durability of the Lozier car after the splendid achievement of this car in endurance contests. The longest races ever run have been 24-hour races. These races in the past three years have been participated in by the most noted cars and drivers of the world. The majority of these 24-hour races have been won by Lozier cars.

Five times have Lozier cars exceeded former world's record figures, and the Lozier car at the present time holds the world's competition record of 1,196 miles for 24 hours. This is a supreme test of durability, for while a car may perform creditably one, three, five, or even ten hours, it has been demonstrated that any car which can run at full speed for 24 hours must possess endurance and be able to withstand strain and abuse far beyond the requirements of any form of touring work.

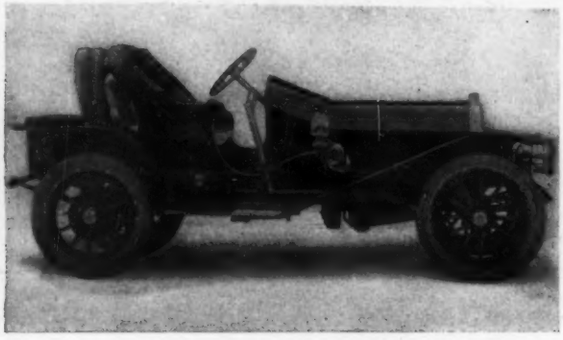
OLDSMOBILE: John T. Cutting, Manager of New York Branch—The brief I hold for the Oldsmobiles is a simple one. In its gist, the most pertinent argument that I could put forth, which would convince the man that our cars may best suit his



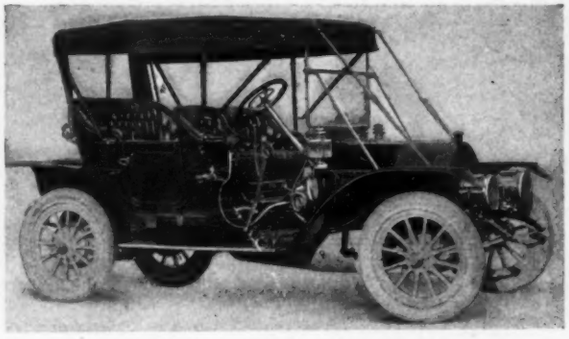
Hudson "20" Four-Cylinder Roadster



Hudson Four-Cylinder Touring Car



Knox Four-Cylinder Sportabout



Knox Model R Close-Coupled

purpose, is that they are "Sui Generis," a Latin expression, which freely translated means, "The only one of its kind," something which has made, and is the occupant of, a class by itself, for no other automobiles have ever made such records for roadability.

A few years ago the statement was made very generally in England, that with the launching of the battleship *Dreadnought* the other navies of the world became obsolete.

With still greater truth it may be said that with the application of big wheels to Oldsmobiles, 36-in. wheels on the "Special" four-cylinder, 40-horsepower model, and 42-in. wheels on the "Limited" six-cylinder, 60-horsepower model, the limitations of all other automobiles using smaller tires became self-evident.

Oldsmobile cars thus removed the last remaining criticism that could be made upon the automobile, by supplying a comfortable and economical need that had hitherto been recognized in all automobiles.

It is still useless to expect to find on other automobiles these features which have given the "Special" and "Limited" Oldsmobile models their high standing among the few great automobiles of the world. The big wheel features are exclusive, and, while other manufacturers may imitate them later on, at present they are original and unique, because used only on the Oldsmobiles.

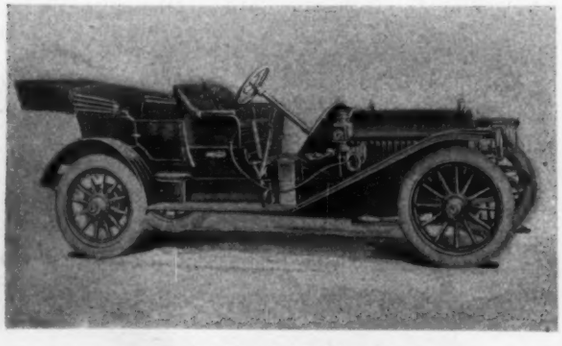
PACKARD: S. D. Waldon, General Manager—There is nothing we might say concerning the desirability of purchasing a Packard car which would be as pertinent and valuable information as our customary suggestion to "Ask the Man Who Owns One."

PALMER-SINGER: Charles A. Singer, Jr., Sales Manager—To a prospective purchaser of Palmer-Singer cars we desire to call particular attention to the following: General design and construction, material used in construction, power and price.

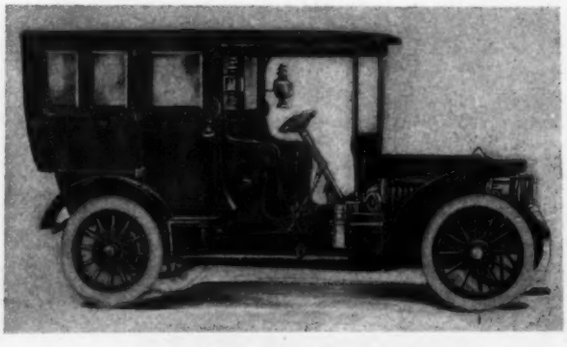
There are no "distinctive features" on Palmer-Singer cars. Every detail and part has been tried out, and after a careful examination of the imported and domestic cars we have taken the best parts of each and embodied them in the Palmer-Singer. Nickel steel is used for the front axle, steering connections, driving shaft and driving axles, also the gears. F. & S. annular ball bearings are used throughout. The radiator is of the honeycomb type—one of the most expensive and efficient on the market. The motors in each model conform to the most approved form of construction and the workmanship and finish cannot be excelled.

We call particular attention to the power of Palmer-Singer cars. By power we do not mean speed, although we have that too. In touring, power is invaluable and with a four-speed transmission, with which all Palmer-Singer cars are fitted, the combination is ideal. Some owners of three-speed cars do not object to climbing a hill or going over a sandy road on second speed, but the general public is becoming educated and is beginning to appreciate the comfort of a fourth speed, using third for city driving and rough country work.

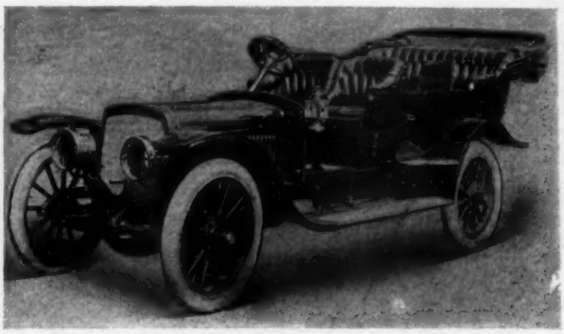
At the price at which they are sold, Palmer-Singer cars cannot be excelled; in fact, our smallest model at $2,150 compares favorably with any car on the market selling at $3,000 or over, and our six-cylinder model at $3,500 cannot be duplicated for $6,000. In closing, "see for yourself" and do not be misled by clever salesmen.



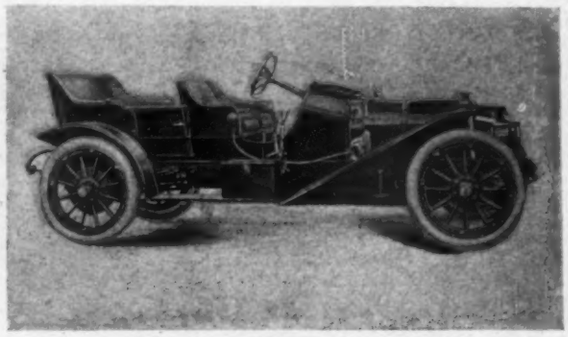
Locomobile Model L Baby Tonneau



Locomobile Model I Limousine



Lozier Six-Cylinder Touring Car



Mercer Model B Toy Tonneau Body

PIERCE-ARROW: R. O. Patten, Sales Department—The unrivaled Pierce-Arrow factory assures the purchaser a product in keeping with all that the best materials and brains can produce.. Six-cylinder motors alone are produced, each identically the same excepting dimensions. Careful inspection of raw materials, again, as a finished part, and in the completed vehicle, means that every car is uniform in its perfection, performance, and durability under any and all conditions as proven by a succession of victories in the Glidden and Hower tours.

Able designing and intelligent distribution of weight, combined with the flexibility of six cylinders and the possibilities of lightness, give large tire mileage and long life to the mechanism.

The employment of cast aluminum for body material in every model is a safety factor, combining the elements of lightness and great strength. Individuality and detail are pronounced in the Pierce-Arrow in color and equipment, an art department having been created for that purpose.

Automatic oiling system, with ability to know at all times the available supply, continuous and positive to all bearings, prevents any part from suffering for lack of lubricant distribution.

Dealers' organization in case of any necessity while touring affords prompt and efficient relief at all times.

Three horsepowers and many standard bodies allow a wide range of selection of open and enclosed cars, each combining the most modern and accepted principles of sound engineering design, with ever in mind the comfort of passengers, ease and safety of control, and at the same time, producing a car of beauty as well as unfailing utility.

Nine years of experience with one end in view—the perfect car.

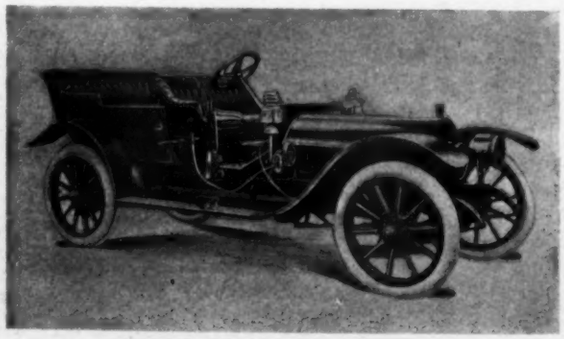
POPE-HARTFORD: H. A. Linehard, Assistant Secretary—The tremendous stimulus to inventive and mechanical genius has developed automobiles which at the price of $2,750 approximate in quality and performance other cars selling at much higher prices. The Pope-Hartford, a conspicuous representative of this class, is a large, handsome car of unusual power, smooth-running qualities and remarkable flexibility. It is reliable, comfortable, a great hill climber, and possesses speed far beyond normal requirements.

Moreover, it is strictly a 1910 car in every respect—not the 1909 car "with refinements." The new lubricating system, giving 750 miles or more with one filling, the remarkably ingenious and effective torque and radius rods, and other distinctive Pope-Hartford features stamp it as a car modern to the highest degree.

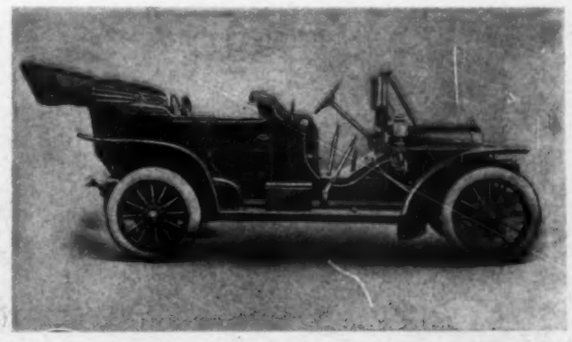
Here is a car of good wheelbase, with a large, handsome body of the latest, straight-line effect, seating comfortably five passengers, and whose engine of 40-horsepower is powerful and flexible enough for every purpose, whether for touring, city use, or racing. A car that can climb stiff grades on the high gear and, as regularly equipped for pleasure driving, is capable of speed over 60 miles an hour on the level.

It long ago proved itself the best hill-climber in its class, and this year a regular stock chassis car made the best time ever made in this country in a long-distance race. It can maintain reliably all day long, up hill and over rough roads with the engine working smoothly and normally, a speed as fast as it is wise or comfortable to travel. In appearance, it is the equal of any car, while in finish and quality of upholstery it could not be excelled.

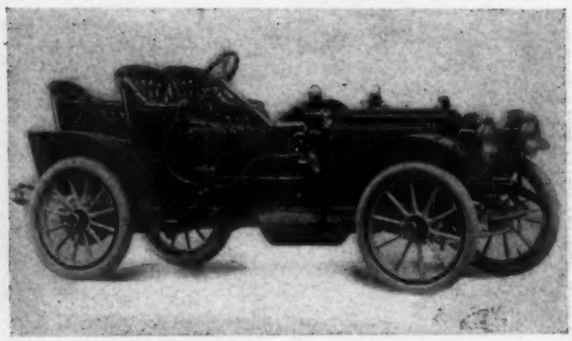
Be it particularly noted that the Pope-Hartford is the selection



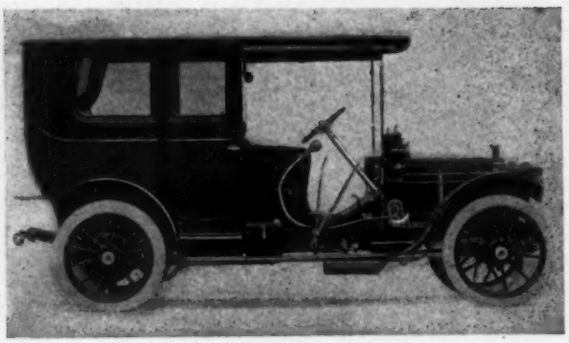
Matheson Model M Six-Cylinder Touring



Matheson Four-Cylinder Seven-Passenger



Packard "18" Four-Cylinder Runabout



Packard "30" With Limousine Body

of owners whose purse has not limited them to the price of $2,750, but whose investigations have led them to know that in all essential requisites the car is the equal of cars costing in some instances nearly twice as much.

ROYAL TOURIST: Hobart M. Adams, Advertising Department—I believe that the purchaser of an automobile should demand that the best of materials as well as the very highest grade of workmanship should be employed on every part of his machine. The other points to be considered are: The motor, the economy of the carbureter, the balance and easy riding qualities of the car, the cost of up-keep, which also includes the possibility of tire trouble. Next come brakes—upon their efficiency depend both life and money.

The day when a motorist confines his driving to city pavements and macadam roads has long ago been relegated to the past. For this reason the present day automobile to be of any great value to its owner must have that durability which only comes from the best material, the highest grade of workmanship and the maximum of motor efficiency.

In the Royal Tourist motor, we believe we have attained the ideal in point of strength and workmanship. After much study we have installed a carburetion system which continued tests have proven the most economical. As to ease of riding, we have demonstrated to the most skeptical that our system of spring suspension, as well as the manner in which the car is balanced, insures to the passengers the maximum of comfort.

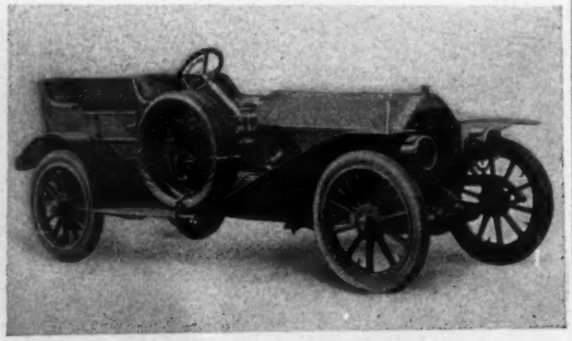
In fact, in the 1910 Royal Tourist we are confident that we have so carefully considered all details that we are ready to make any kind of demonstration that any kind of high-grade car would be called upon to perform. While the Royal is built with the greatest care by the best workmen it is possible to secure, we have also produced a car that the average motorist, with a little study can master—because we have built a car, which, after all, is simply constructed.

SIMPLEX: John G. Dale—A feature which is very important as well as interesting to the prospective buyer, is the fact that our Simplex cars are made in New York City, where any necessary repairs can be promptly made and an abundance of spare parts always on hand. Also, that the material used in the car is not found in any other make of American car, being Krupp chrome nickel steel, which makes it necessary for us to import this material from Germany.

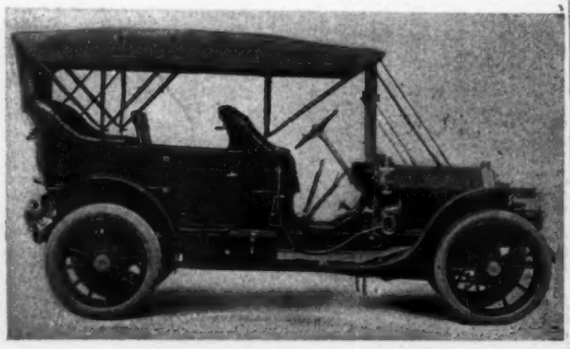
Another strong argument in its favor is the speed and reliability of the car, which has been proven time and time again in road races, 24-hour endurance contests and hill climbs. Although an intending purchaser may not at all be interested in racing, still a favorable impression must have been made by the fact that the Simplex car won in 1909 every speed and endurance contest in which it was entered by this company, showing without any doubt the dependability of the car. In fact to win three consecutive road and 24-hour races is a feat which has never before been accomplished by any make of car, whether foreign or American.

Our final argument would be a reference to all of our customers, which is the best advertisement that any concern may ever expect.

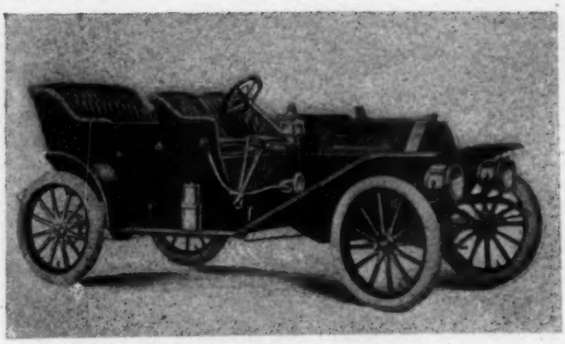
STEARNS: Roy F. York, Vice-President—Long life, easy riding qualities, minimum weight commensurate with power de-



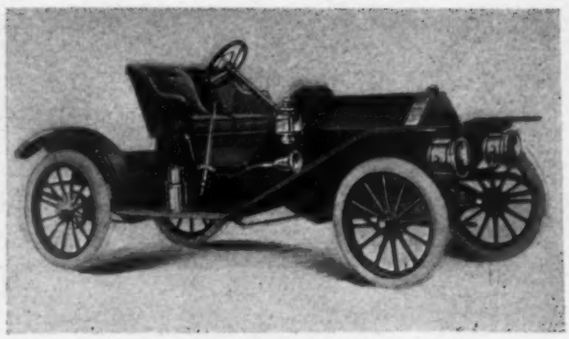
Palmer-Singer Six-Cylinder Touring



Peerless Model 27 Four-Cylinder



Overland Model 42 Touring Car



Overland Model 38 Runabout

veloped and the quality of materials used in the construction of Stearns motor cars are among the most urgent reasons for the purchase of machines of this make.

The long experience of the F. B. Stearns Company—1896 to 1910—coupled with the fact that yearly models are no longer placed on the market, safeguards the purchaser. No Stearns model has ever been withdrawn from the market—a sure guarantee that design and construction are absolutely correct to the minutest detail, and have been from the first.

In buying a Stearns, the purchaser has the satisfaction of knowing that he is securing a car capable of extreme speed when desired—attested by the many records made by Stearns cars in the past ten years. Although the F. B. Stearns Company has never built a racing car in any sense of the word, many records made years ago have withstood all efforts to break them. For over two years our company has refused to enter contests, being followed in this by many leading manufacturers, yet scarcely a month passes that contests are not won by Stearns owners driving their own cars.

In the construction of Stearns cars, the factor of safety has always been of the utmost consideration. It is the belief of our engineers and designers that a motor vehicle should be as safe as possible, regardless of expense of materials or additional cost of workmanship. The Stearns steering gear has often been called "the safest in the world" and not without reason. In driving at high speeds, the life and safety of the occupants of an automobile are absolutely dependent upon the reliability of the steering mechanism, and flaws or weaknesses, either in design or construction of the machine, can well place the lives of those in the car in jeopardy. For this reason the aim has been to render the car as safe at a 65-mile-an-hour speed as at ten.

STEVENS-DURYEA: A. W. Barber—With most of the characteristic features in the design of Stevens-Duryea motor cars motorists are already thoroughly familiar, and it only remains, therefore, to draw special attention to some of the time-tried details of construction for which the Stevens-Duryea Company has an enviable reputation.

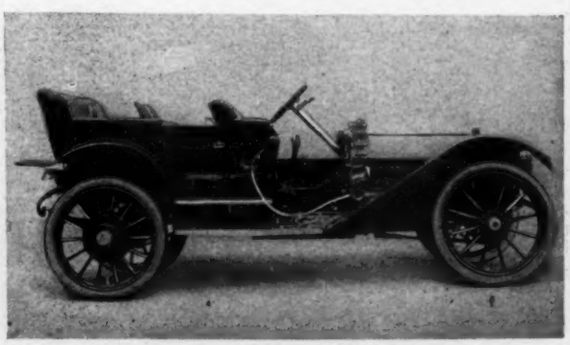
Accessibility not only covering the operating levers, but the component parts of the chassis as well, clearly shows the attention that the engineers have given to the entire car.

The unit power plant, supported on three points, allows for a most compact construction of the motor, clutch and transmission, there being not one section of the unit which cannot be inspected or removed without disturbing body or dash.

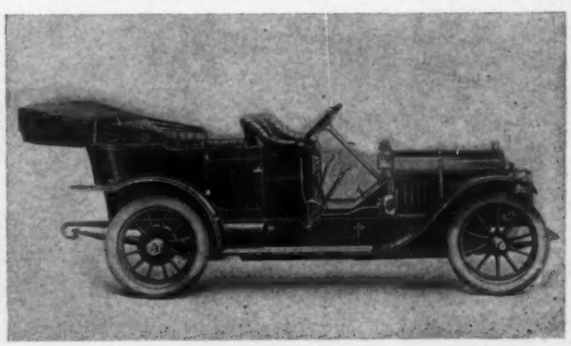
Motor section has an exclusive feature, the removal of one or all pistons without removing the cylinders, crankshaft, or breaking the water or oil connections. By simply removing the lower half of the crankcase the pistons may be withdrawn for inspection or cleaning.

The clutch, which is of multiple disc type running without oil, is of unit construction, directly at the rear of the engine. This clutch has proven eminently successful in all touring cars since 1904, not only because of its simplicity of design and ease of operation, but also due to smoothness with which it applies power of engine to rear construction.

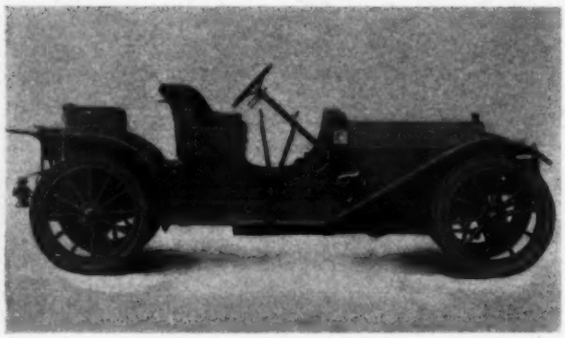
Removal of complete clutch does not necessitate the loosening or displacement of a single nut or bolt of power plant, excepting the aluminum cover and connection with engine and transmission.



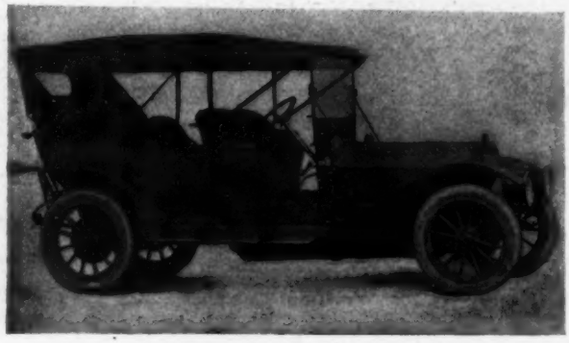
Oldsmobile Limited Six-Cylinder



Pope-Hartford Model T Touring



Pierce-Arrow 6-36 Runabout



Pierce-Arrow 6-66 Touring Car

A transmission of the sliding gear type in simpler form could not be incorporated in any motor car. The case is cast without the usual central horizontal division, making it absolutely oil tight, only a cover plate attached by three thumb nuts has to be removed to allow the entire gearing to be inspected, while a complete removal of gears, shafts and bearings may be accomplished by removing oil retaining caps and withdrawing the parts through large opening at top.

Clutch and transmission are directly below the front-seat floor boards. This very accessible location is appreciated as it affords the possibility of a thorough inspection and ease of oiling, so much desired by the tourist.

As a detail in refinement, the keyless construction of the entire drive line is representative of the very highest engineering skill. This emphatic statement is worthy of careful consideration, as this structural feature is exclusive and found only in Stevens-Duryea motor cars. The design used is a series of squares and taper squares at connecting points, making a drive line that runs perfectly true and adding a marked degree of ease in the removal or replacement of a section.

A vibrationless power plant with a wonderful degree of flexibility and power at all speeds, mechanically correct in its design of mounting in chassis frame, has been standardized in all Stevens-Duryea motor cars.

The unit power plant, multiple disc clutch and shaft drive are milestones in motor-car history, and to these features the Stevens-Duryea Company points with enthusiasm, as original with and successfully marketed by them since 1904.

Even a casual glance at the entire line of cars for 1910 boldly brings out the fact that scientific design is synonymous with the name of Stevens-Duryea.

THOMAS: E. R. Thomas, President—Aside from the old reliable Thomas Flyer, which won the New York-Paris race, with which everybody is familiar, we have three other types of cars, known as the Thomas 6-70 Flyer, or Big Six; the new 6-40, Long-Stroke Flyer Model "M," and the Town car.

Each of these models has its strong features, for instance, if I were a man who wanted a large car, I would buy the 6-70 Flyer, because it is the largest, most luxurious, most powerful, easiest riding, most completely equipped automobile constructed.

It is, therefore, in a class by itself—it has no competitor.

On account of the wonderful flexibility of its six-cylinder motor and its excessive power, it is not necessary to "rush" hills or travel fast over bad stretches of road.

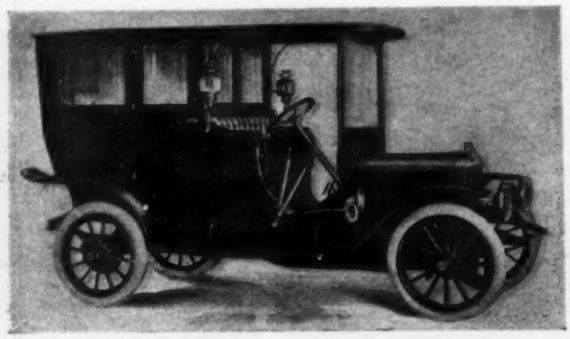
Due to its long wheelbase and splendid spring suspension, this car rides over the worst roads and hills without discomfort.

Then, too, it is possible to travel a greater distance in a day's run, because being a powerful car you avoid the frequent necessity of slowing down to change gears. This car will take almost any hill on high gear.

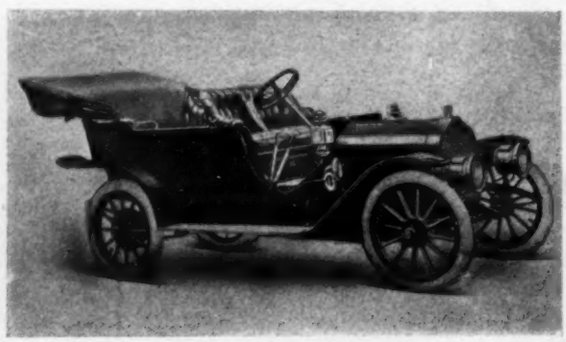
Except for its reserve power, caused by the addition of two cylinders, it is practically the mechanical duplicate of the car that won the 22,000-mile endurance contest around the world with which everybody is familiar.

I think the winning of that event proved that the Thomas Flyer was reliable.

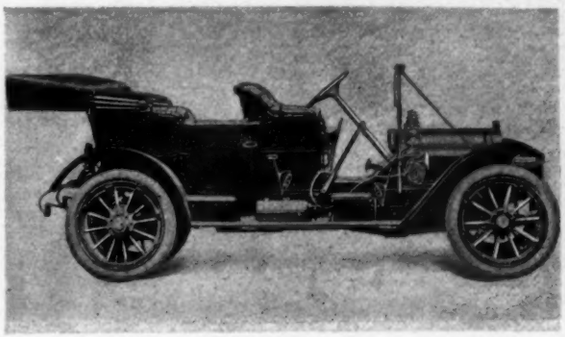
Its price of $6,000 include a complete equipment, including a top, glass front and every accessory that the average owner needs.



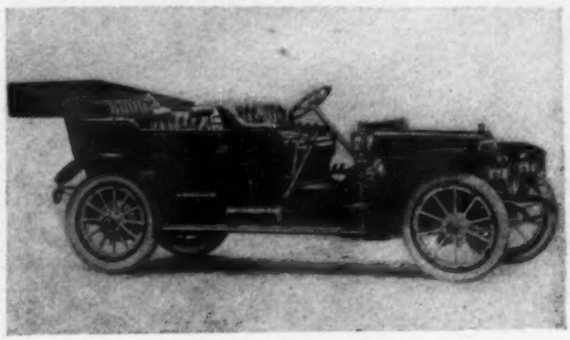
Selden Model 29 Limousine Body



Selden Model 35 Touring Car



Stearns 15-30 Four-Cylinder Touring Car



Stearns 30-60 Four-Cylinder Touring Car

The new 6-40 "Long-Stroke" Flyer is the best buy on the market for the man of moderate means for three reasons.

First, while it is rated at 40, it actually develops 60 on test, so you can see that it has plenty of power for its weight.

Its six-cylinder long-stroke motor has a flexibility which is wonderful. You can run from two to sixty miles an hour on high gear, and that's something which I think no other car can do.

The price of $3,500 includes nearly $500 worth of equipment, consisting of a beautiful silk mohair top, folding glass front, speedometer, shock absorbers, acetylene headlights, oil side and tail lamps, horn, robe rail, tire irons, Prestolite tank, and a complete set of tools, not to mention the tire equipment which is larger than that used on a great many cars of greater weight and higher price.

WHITE: Windsor T. White, President—The design of the White gasoline car is at least one year in advance of any other American machine. At the recent automobile show in London the White was classed with five or six of the leading foreign makes as being of the most advanced design among the cars exhibited. The White is the only American car which has the true "long-stroke" motor and is the only American car wherein the intake and exhaust passages are contained within the engine casting. The "long-stroke" motor is being adopted by the leading foreign builders, as it has been settled beyond all question that a "long-stroke" motor gives increased power, increased efficiency, and far better fuel economy.

There are many advantages of including the intake and exhaust passages within the engine casting. First of all, the design is greatly simplified and this construction gives an unusually neat appearing engine, for the reason that there are no external manifolds.

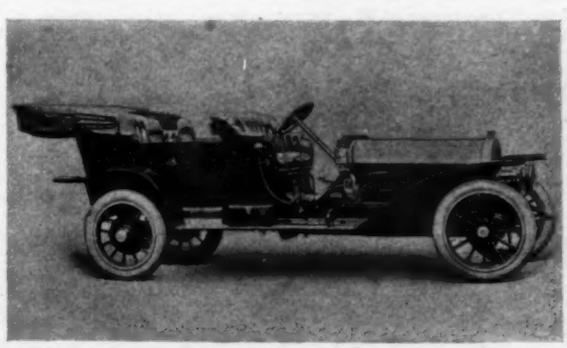
There is but a single intake pipe leading from the carbureter to the engine, and but a single exhaust pipe leading from the engine. The intake gases are heated while on their way through these passages to the cylinders, with the result that there is no condensation of the charge, and, therefere, every particle of fuel is used efficiently.

Exhaust passages within the engine casting are surrounded by water-jackets, with the result that the exhaust gases are cooled as soon as they issue from the cylinders, and there is, therefore, a considerable reduction in their pressure. This reduction of back pressure is another factor which tends toward unusual economy and efficiency.

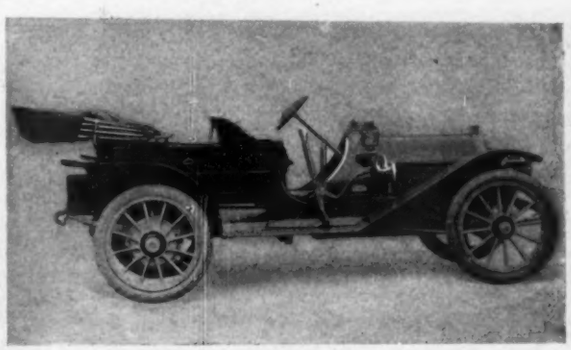
Another feature in which the White differs from all other American cars of moderate price and moderate power, is that it has a four-speed transmission with direct drive on the third. The third gear is utilized for running around town and for the average touring conditions, while the fourth speed is used whenever conditions permit of very fast running.

These two purposes cannot be properly combined in a single gear and the attempt to make a third gear answer for both moderate speed and for very high speed is not good engineering and has not proven satisfactory.

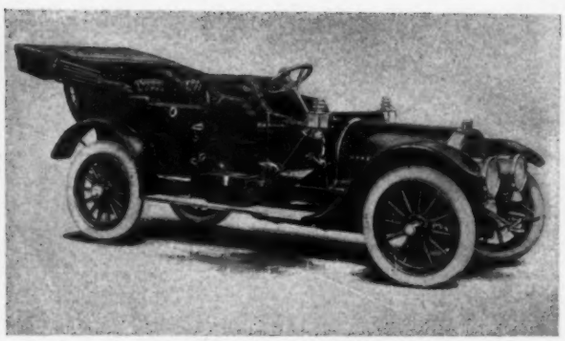
The materials used in the White car are the best which money can buy. For many of the materials used we pay just twice what is ordinarily paid for materials entering into cars of moderate size and moderate price.



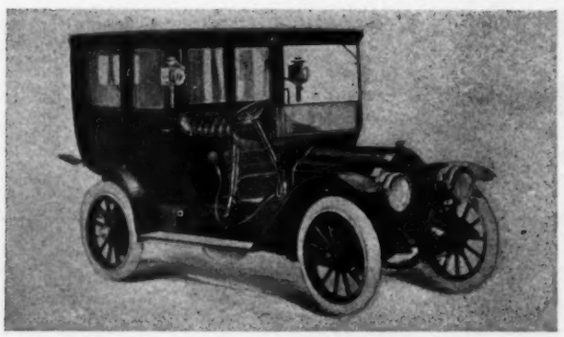
Stevens-Duryea Model Y Six-Cylinder



Stevens-Duryea Model XXX Four-Cylinder



Royal Tourist Four-Cylinder Touring



Studebaker-Garford Model G-7 Limousine

WINTON: Charles W. Churchill, Sales Manager—Among the reasons why a prospective purchaser should decide upon the Winton Six rather than any other car are:

It is a six-cylinder car, the type now ranking as highest in motor car construction.

Its motor starts from the seat without cranking, thereby obviating physical labor of an objectionable and sometimes embarrassing kind.

Its cost of up-keep has proved it to be the most economical car to maintain.

Its purchase price more nearly represents actual physical value than does the price of any other high-quality car on the market.

TOO LATE FOR REGULAR ARRANGEMENT

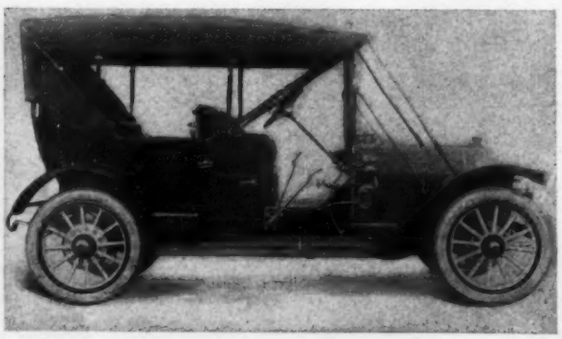
CHALMERS-DETROIT: Carl H. Page, Metropolitan Selling Agent—The 1910 models of the Chalmers-Detroit cars require little, if any, explanation. We have nothing to defend because nothing untried; nothing to argue about because no theories to advance. A year ago perhaps the situation was a little different. Then we were announcing a revolutionary innovation in automobile making—a strictly high-grade, five-passenger car for fifteen hundred dollars. The value we claimed for this car at the price alone was enough to insure that the car would be given the most careful scrutiny by the public and the trade. The unusual value offered, taken with certain features of construction new to this country, gave rival manufacturers and dealers an opportunity for adverse criticism—an opportunity which many embraced and held.

A two-bearing crankshaft, cylinders cast *en bloc*, the unit power plant, one-pedal control, ball-bearing construction—all came in for bitter attack. They said we had a theoretical car that could not make good. Now after watching it in use by owners all over the country—after reading the marvelous records for speed and endurance it has set after all kinds of contests for a year—everybody is forced to admit that if it was a theoretical car from the beginning, then the theory must have been right, for no car in use has given more complete satisfaction.

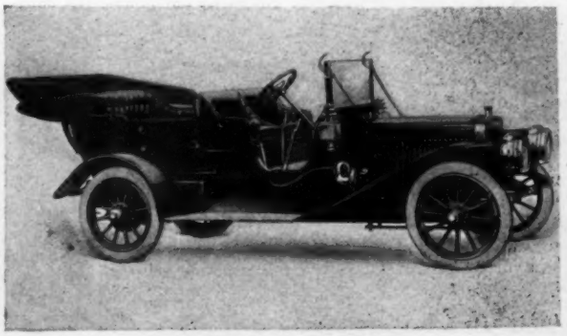
Greatest among the things we or anyone can say about any car we might build is simply that "it is a Chalmers-Detroit." That name means more than any single feature—more than any one part—more than any argument or opinion. It is the sum total of all the good points—it is the stamp of genuineness—a badge of merit and superior excellence.

For 1910, the general policy of the Chalmers-Detroit Motor Company is unchanged. It has been our policy always to give the greatest motor car value for the price asked. We do not want any prospective buyer of an automobile to believe these things merely because we say them—make your own investigations. If you do not know, yourself, ask someone who does. The more a man knows about automobile construction, the easier it is for us to sell him a Chalmers-Detroit car. "The utmost value at the price" is our ambition, and we let Chalmers-Detroit owners say whether we realize it.

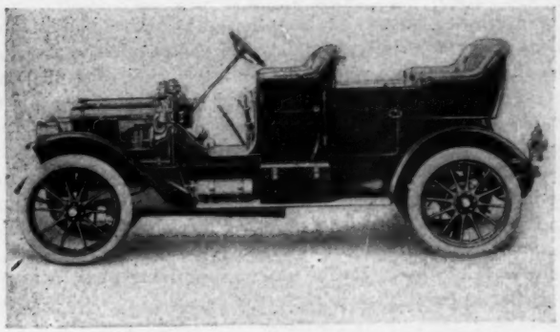
MATHESON: C. W. Matheson, President, Matheson Automobile Company—Almost every Matheson customer has previously owned one or more automobiles of other manufacture. The percentage of Matheson customers having previously



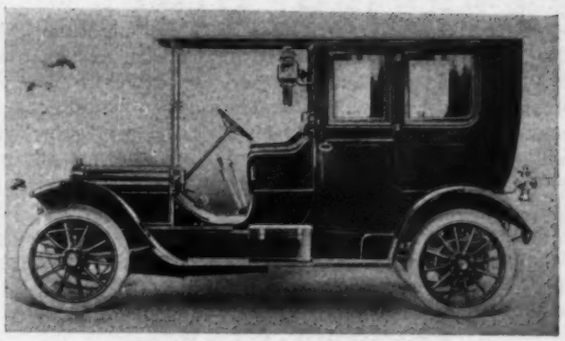
Thomas Flyer Model M Six-Cylinder Touring



Winton Model 48 Six-Cylinder Touring



White Model O-O Steamer Touring Body



White Model G-B Gasoline Limousine

owned other cars was so large, that we undertook to determine, if possible, how many Matheson owners had ever changed to any other car after purchasing a Matheson, with the following results: Out of all the returns received from customers who had bought Matheson cars as far back as 1905, only two had ever changed to any other car; one expressed regret for having made the change and the second changed back to the Matheson again this season after having driven one season with another car. Over 90% of Matheson owners have previously owned other cars. The above facts indicate a degree of reliability in Matheson construction which apparently was not equalled by any other make of cars which our customers had previously owned.

Further statistics gathered from Matheson owners resulted in the following showing: Average mileage per car, 12,840 miles; average repair expense per 12,840 miles, $36.41; average miles per original set of tires, 4,086, and average miles per gallon of gasoline, 11 miles.

The average prospective customer readily understands the meaning of the above records.

Finally we sum up our claims when we publish in our catalogue that the 1910 Matheson Six is guaranteed to be better constructed, swifter, more economical in fuel consumption and tire wear, more comfortable and to have more thoroughly mechanical and approved features of design than any other six-cylinder car on the market, European or American, at any price.

Three thousand dollars buys the Matheson Six and $5,000 buys the Matheson Four, both cars being the most indestructible cars of their respective types on the market according to our claims and guaranty, and according to the freely-given testimony of our hundreds upon hundreds of satisfied customers.

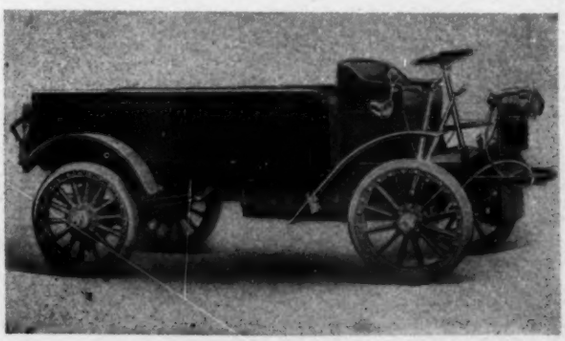
SELDEN: Charles Van Horne, Sales Manager—When George B. Selden built his first automobile and secured from the Government his famous Patent No. 549,160, he offered the world the best the times afforded; it was a practical working automobile, but it was in advance of the age; people were not ready for it; capitalists whom he tried to interest in the business thought him visionary, chimerical, impractical, a dreamer.

Yet the car built at that time was really the prototype of the car built to-day, just as the first locomotive that pulled a train was the prototype of the modern giant of the rails, but it took time, counted by years, to improve and refine it and standardize its lines.

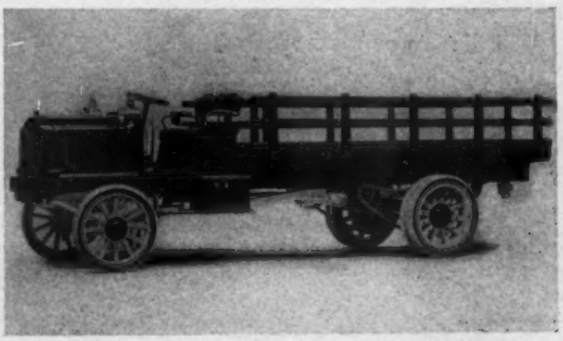
Of later years the car, most carefully designed by Mr. Selden, with the aid of a corps of expert engineers, after years of further experimentation and study, was as vastly superior to the earlier type as the modern locomotive is superior to Stephenson's primitive engine of 1814. And the analogy is plain and true.

In both cases the earlier creations ran all right, but not as they run to-day. In both cases the essential principles were there, but the improvements and refinements were evolved only with the advance of time. It is perfectly fair to presume that if Elias Howe were now alive and in vigorous health, and at the head of a sewing machine manufactory, he would certainly see that no competing machine could be built better, or embody more good features and improvements than his.

It is in this position that Mr. Selden is placed to-day, when many other good cars are being made by licensees under the



Autocar Model XXI Two-Cylinder Commercial Car



Packard Three-Ton Truck with Platform Body

Selden patent and sold in active but friendly competition, his pride alone in his pet creation, to say nothing of his commercial interests, would make it unnatural and impossible for him to father anything inferior in mechanical features or quality.

This is the spirit which animates his entire factory and selling organization. And it is all so fundamental and so forceful in its logic as to constitute, in my judgment, the best possible reason why the public should have every confidence in and buy the Selden car. There are a great many good reasons why people should buy the Selden car, and this is the reason there are so many good reasons.

COMMERCIAL CARS

ALDEN-SAMPSON: P. H. Breed, Chief Engineer—During the comparatively short time since the Alden Sampson Manufacturing Company, of Pittsfield, Mass., developed and placed one of its four-ton trucks under test in their Motor Transportation Company in Boston, the trucks have excited a tremendous interest among our industries, whose engineers saw at once that here was a truck which embodied ideas and points in design neglected in others, and which seemed to have been designed with the idea that a truck, though doing rough, heavy work, was yet necessarily a machine of fine parts and fine materials, which ought to be protected in their workings to insure economy.

Considering the short time since its development the sales have been most gratifying and the interest shown through inquiries is constantly increasing.

The few points of design and workmanship outlined below will show that the effort to build the best and to greatest advantage of the user is always of universal interest. The engine is of 5-in. bore by 5½-in. stroke, and is governed to run at about 925 r.p.m. It is designed and built by the Alden Sampson Manufacturing Co. especially for truck severity, its main bearings, 2⅛ in. by 4¼ in. and 2⅛ in. by 5¼ in., give an idea of the general design and show that nothing but an engine designed and built especially for truck work will stand.

Other features noted in the engine are thermo-siphon water circulation with 2½-in. pipes, forced oil system through crankshaft, large inspection doors and magneto ignition. A large, lubricated, box-type of universal joint with auxiliary bearing surface for the blocks (patent applied for) transmits the torque of the engine to the transmission case.

This transmission is designed and built especially for the truck, has gears of 4 pitch and about 2-in. face, and the shafts run on Hess-Bright ball bearings, transmitting through hardened 3-pitch bevel gears to the spur gear differential, thence through floating side shafts and roller chains to the rear wheels.

The differential is provided with a simple interlock, which enables its operator to lock both wheels together thus avoiding difficulty if one wheel loses traction or a chain should break.

The chains are enclosed in oiltight, sheet steel cases, which act also as distance members and brake torque supporters, and which insure a continual high efficiency and long life to this most important part of a truck's mechanism.

As the chain case fits down to the small diameter of the hubs, the wheels are built on false hubs, which allow them to be removed without disturbing chain or chain case.

The frame is either reinforced channel section or pressed steel and is hot riveted throughout. Axles are drop forged, of I-section, and carry plain wheel bearings of bronze in steel, the most reliable wheel bearing ever used and of highest efficiency. Every part of the "Sampson" truck is designed and built at the factory of the Alden Sampson Manufacturing Co., and built to jigs and fixtures which guarantee every piece interchangeable.

GENERAL VEHICLE: C. W. Squires, Jr., Sales Department—Of the total number of commercial electric vehicles in use the General Vehicle Company have manufactured over 1,600. These vehicles embody the adoption of all the valuable features that make for reliability, economy, durability, general excellence in simplicity of design, and highest class workmanship and materials. The rejection of hundreds of ideas that have been found impracticable, or that for any reason would in some detail have reduced the value of the machine to its owner, is best evidenced by the readiness of the General Vehicle Company to give to its customers a guarantee contract limiting the annual cost of upkeep for a period of years within a fixed sum; thus eliminating at once all uncertainty on the part of the owner as to the cost of maintenance of tires, wheels, bearings, steering gear, controller, motor and battery.

There is a growing appreciation of the economic value of the cardinal features of excellence of the electric commercial vehicles of the General Vehicle Company. These salient points are the one motor drive, roller bearings, enlarged battery capacity, and a conservative rating based on a liberal factor of safety throughout all details of the vehicle.

The combination of these features results in a marked reduction in weight, an increased mileage per battery charge, reduced battery maintenance and not less than 50 per cent increase in efficiency over all electrics using two or more motors.

HEWITT: Edward R. Hewitt, President—We have been a long while in the commercial business and have had cars out on the road for four years and a half. In this time a vast amount of experience has been accumulated and the older cars have been carefully observed and their defects noted and corrected in the newer models. We have built cars, from the "light delivery" carrying 1,000 pounds up to the 10-ton truck, in six or seven models.

In all cases we have used the planetary gear with interlocking pedals, and have become assured of the fact that a control in this way is easier to drive and safer in operation in big cities than one controlled by means of a shifting gear box and clutch pedal. This arrangement enables the driver to have both hands on the steering wheel at all times, which is a matter of great importance in heavy cars which often requires considerable effort to control them.

In many cases customers wish to break in their horse drivers or other factory employees to drive the trucks. With this simple pedal control anyone can learn to drive the car in a few minutes, and we have large numbers of cars out which are operated by men who are not skilled automobile drivers. These cars are in most cases working fully as satisfactory as those in the charge of skilled men, especially when the cars are properly inspected on their return to the garage.

We can give our customers cost sheets of maintenance costs of all different types of cars, made out by our customers when the cars have not been in our control. We can refer prospective customers to many of the largest concerns in New York who have been using our cars for a considerable time and have given us repeat orders. This seems to be very good evidence of the value of the cars.

Our motors are constructed with specially large bearings and of very strong materials so that they show a minimum amount of wear, and the whole car is designed so that the maintenance costs will be reduced to the lowest possible point.

We have been pioneers in many of the newer improvements in commercial cars which have been adopted by nearly all our competitors, such as the block tires, the fixed spark with high-tension magneto, the radiator suspended on springs, etc. We can show fully as good gasoline economy with our planetary two-speed box as other manufacturers can show with three and four-speed boxes, thus proving the superiority of our motors. We are doing the same work with the small motor that other manufacturers are doing with the large motor, which means less expense in every way and less wear and tear on the car. Our greatest claim for our cars is the report from every user.

·Distinguishing · Features · ·Found · in · ·1910 · Product ·

By Thos. J. Fay

PRODUCTION in quality will be on a solid basis in all probability, because, in an establishment devoted to production in a large way, the equipment must be on a high plane. For this reason the automobile plants in America have outstripped the foreign producers, the latter devoting themselves, principally, to the limited manufacture of automobiles, using a surfeit of cheap labor, however skilled, in lieu of precision of method, as dictated by automatic machine tools, jigs, fixtures and gauges.

Skilled labor is an absolute essential—and a well conducted establishment counts for much, but, nevertheless, if all facilities afforded depend upon manual labor, even of the highest type, which is not aided or guided by fixtures of precision, then the finished product will be a miscellaneous assortment so far as interchangeability is concerned. This latter much desired quality is absolutely impossible in any plant where men must lay out the work by hand and where they are unaided by appliances which insure accuracy.

This year marks the turning point in the history of American automobiles, and noiseless performance is now regarded as an absolute necessity. The average autoist, while wishing to possess a noiseless performer, merely because the noise is disagreeable, may possibly overlook the basic reasons for noiselessness as a desirable acquisition. Noise is the most certain indicator of lack of harmony as it reflects absence of perfect fit. There is no instrument of precision devised which will so quickly and accurately indicate absence of proper relation as will an ill-contrived arrangement which produces noise, even though it may work.

When noise is present, power is absorbed, and the energy so taken up is dissipated as heat and noise. The noise hurts the feelings of the owner of the car, but it is the heat which does the most damage to the parts. That the noise is a manifestation of a condition which does damage to the parts, is a matter, however, which should not be overlooked. Noise follows vibration, which in turn sets up stresses in the parts vibrated, and in fine, the life of the members may be measured in terms of vibratory value in a testing machine contrived for the purpose. It is now a well-established fact that the vibratory life of ordinary steel is alarmingly short, whereas the same value in the finest alloy products, now to be had, is not high enough to warrant the builder of automobiles to wholly disregard the consequences.

Silent Performance a Sign of Quality—In the successful struggle to avoid noise, the makers of 1910 automobiles have done more by way of introducing quality, than was ever managed in any other way and it has been necessary to concentrate effort on certain units in connection with well-defined parts in order that success might attend the effort. It has always been extremely difficult to make gears so that they will perform noiselessly. Broadly speaking, noise in gears has always been tolerated, and it was the claim of designers that this particular source of noise was not necessarily an indication of a short vibratory life of the parts. They were justified to some extent in this belief, on the ground that the noise was made by the clatter of the teeth in contact.

Unfortunately for such reasoning, the hammer blows, which resulted from this clatter of teeth, were transmitted to the section of metal in the members, and the vibratory ills resulting made it difficult to predict the length by normal life of the parts affected. However, it was fairly well understood that the depreciation was of a serious nature. Two or three years ago, when this phase of automobile building was concluded to be of serious import, it was observed that in painting the chassis, the painter was sometimes inclined to kill noise by allowing the paint to migrate into the bearing surfaces, and as a matter of fact, the painter's carelessness became the maker's method; paint served very well to kill noise, and it served a very good purpose in some of the earlier, indifferent efforts.

This information, together with experience and the improvement of methods, has enabled the high-class builder of automobiles to limit the painter to his legitimate zone of activ-

Fig. 1—Gleason planer, used in the Thomas and many other plants to produce noiseless bevel drives

Fig. 2—Fellows shaper, by means of which transmission gears are cut to exact size

ity, by the simple process of making parts so closely to size that noiseless performance is a normal expectation.

BEVEL GEARS

In the production of bevel gears of a 4:1 ratio, which is not uncommon, the gear must have a large number of teeth in order that the pinion will have enough teeth to conform to good practice. It would be the very best practice, were the pinion made with a minimum of 18 teeth, but a minimum of 14 teeth is the absolute limit. With 18 teeth and a 4:1 gear ratio, the gear would have 72 teeth, and would be over 15 inches in diameter were the teeth 5 pitch. In any event, the pitch must be fairly coarse and is frequently 4, whereas it is very rarely finer than 5. These limitations indicate that the gear wheel in the bevel drive must be relatively large in diameter, and designers have learned by experience that it is necessary to fashion them so that they will not deform, either in the machining process, in the planer or while being heat treated.

The first effort towards noiseless gears is made in the engineering office. Here the shape for noiselessness must be devised, and the materials for use selected, in view of the service to be rendered—also the process devised through which the gears are to be put, considering the facilities available in the shop in which they are made.

Bevel gears are in constant mesh, avoid clash and the resultant shock. Consequently they are usually made of die forging, cementing steel, in which it is the aim to limit the carbon content to that which will afford a soft dynamic core as the foundation, thus assuring desired service.

Repeated Annealings During Forging.—In the forging process, which, for the large bevel gear, may require three operations, it is the practice to anneal between operations, partly to save the dies, and finally, to prevent deformation in the after machining and treating processes. To be sure, however, that the gears will not hold internal strains, they are reannealed after sand blasting. This latter process quickly removes the oxided surfaces, and renders the final annealing process more effective. Pickling, which was the former preferred method of removing oxide, has been supplanted by the sand blast in this work, not only because the sand blast is quicker and less expensive, but also on account of the aid it gives the inspector, who, with a little experience, is enabled to locate at a glance blemishes in the metal if they are present.

After the sand blast and the inspection, the forgings are machined to exact size and then copper plated. The copper plating is of considerable depth, it having the facility of shielding the metal, excepting, where the copper is cut away, during the tooth-planing effort, so that in the cementing process only the surfaces which are necessarily to be hard are carbonized.

It has evidently been the experience of the makers who resort to this copper-plating process that gears are more likely to warp if they are carbonized on all surfaces, as is the case in the absence of copper plating. After cementing, considering the copper-plated gears, it has been found that they warp but slightly, and as to strength it would seem to be quite in accordance with the requirements. In this instance, the armor, which is entirely over the toothed surfaces, performs a dual operation, *i. e.*, rendering the surfaces glass hard, and so preventing abrasion and adding strength to the teeth to the extent they adhere to the body with greater tenacity than would be true in the absence of the hardening process.

Matching Up Done Afterwards—In some of the earlier efforts to attain noiselessness, the Packard Company, for illustration, introduced a measuring machine, and by a process of matching up, was enabled to pair off from 55 to 60 per cent. of all the gears made as coming within the standard represented as noiseless. The balance of the gears, while they were thoroughly good in every way, excepting as to this one difficulty, were discarded on the ground that noise was objectionable from too many points of view to be tolerated in Packard automobiles.

The companies which passed beyond the point where noisy gears will be tolerated in their product have introduced the finest types of gear shapers and planers, one of which is shown in Fig. 1. This is a Gleason planer, the photograph having been taken at the Thomas plant in Buffalo. In many of the practices the teeth are gashed in milling machines, or by a hobbing process before they are put in the Gleason planer, or the "builder and shaper." This latter machine is much used in many plants, and the idea of gashing is to "rough out" the excesses of metal in order that the precise tooth-forming machines may do their work with greater speed and unquestioned accuracy, and without damaging the tools, which are relatively delicate and rather high priced.

Fig. 3—Pierce-Arrow testing machine, used to load transmission gears to try them out

SQUARE CUT GEARS ARE ACCURATELY MADE

Fig. 2 shows a Fellows shaper working on sliding gears after they are machined to size, and before they are forwarded to heat treating and hardening process. This shaper represents a principle much in vogue—one capable of shaping the teeth to approximately the right theoretical contour. By a strictly shaping method, involving the process of cutting away progressively a little metal at a time, over the faces of the teeth, each tooth in succession being operated upon so that the final cut for the finished surface is the same over every tooth. In this process the shapes conform to theory very nearly.

After the teeth are cut, the gears are set up in a special machine devised for milling the wedge-like contour on the clashing ends; this work was formerly done by hand, but it is now universal practice in America to employ automatic contour milling machines because they reduce cost enormously, besides increasing quality perceptibly, since each tooth is in precise accord with the other—and also the amount of bearing surface of the meshing mates on the pitch line is increased considerably.

Fig. 3 shows how the Pierce-Arrow gear sets are tried out in a testing machine after the whole is assembled. Here the purpose is to first adjust the relations of the matting gears to noiselessness, thereafter ascertained through actual loading, if the system as a whole is strong and to determine the mechanical efficiency, thus proving that there are no undue losses, pinched bearings, or cramped parts, and sweet running qualities are normal expectations without undue care.

This testing equipment shows very clearly in the illustration, and in one way or another tests are made involving the same principle in the better class of plants, to prove out qualities of transmission gears and live rear axles.

Probably one of the distinct advances of recent times in automobile work lies in the fact that testing equipment is afforded, by means of which gears, shafts, and relating members are tested to the absolute limit of the work that will have to be done in practice, with the expectation that they will show competence. This competence, besides involving the use of excellent grades of materials, takes into account special methods of heat treatment and facilities such as Figs. 4 and 5 depict.

These precise methods are the result of accumulated knowledge, due to the effort of many advanced investigators, and in the absence of system it would be utterly impossible to maintain production and quality on the sufficiently high plane desired. This same system, to which all men must become slaves, if they partake of the method, emanates from a supreme and knowing head, ramifies in beaten paths, and is best appreciated when the product of the effort rolls silently away.

Fig. 6 represents a group of brains, brawn and equipment, laid out in a "schematic" sort of a way, with the expectation of accentuating the point to be made. In this group:

(A) Represents the executive head of the establishment, taken at the plant of the Warner Gear Company.

(B) Is the intercommunication system utilizing a central station telephone system.

(C) Represents the executive, stenographic and clerical forces, taken from actual life, at the Rambler plant, Kenosha.

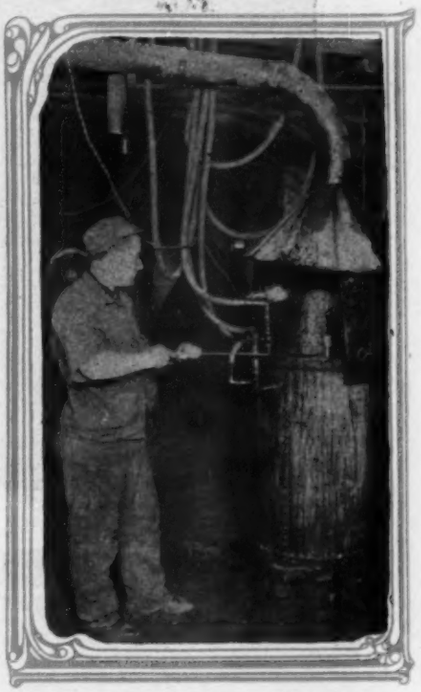


Fig. 5—In the Woods plant, showing one unit of the quenching equipment in which air is used to refrigerate and agitate

(D) Is emblematical of the engineering office, showing a battery of designers in action at Warner gear plant under the direction of the chief engineer.

(E) Is a testing machine in the laboratory ascertaining the ability of steel to withstand alternate shock components. This view coming from the Woods Motor Vehicle Company, Chicago.

(F) Shows a large press in drop-forging work at the Rambler plant, Kenosha.

(G) Presents a roughing process in the manufacture of crankshafts as used in Excelsior motors.

(H) Shows grinding work in the establishment of the Woods Motor Vehicle Company, Chicago.

(I) Shows a hydraulic press as used in the Pierce-Arrow plant at Buffalo, in the production of high-grade wheels.

(J) Shows a disc fan, as manufactured in the McCord plant at Detroit, and, as will be observed, all blades, including the flanging portion, come from a single piece of sheet steel.

(K) Shows the woodwork complete of a wheel as used in a Pierce-Arrow car.

(L) Is a view of the assembling room at the Chalmers-Detroit plant.

(M) Depicts a testing machine with a transmission gear in place, the photograph of which was taken at the Thomas plant in Buffalo.

(N) Shows a special machine with a revolving platen, mounting a number of chucks around the periphery, and the work feeding down from a hopper, thus establishing a continuity of the operation, since the workman feeds the empty chucks during the tooling operations, and as one chuck is invariably in line with the tool, the work goes on uninterrupted.

Fig. 4—A corner in the heat-treating department of the Woods plant, showing electric salt baths in the heating process

Fig. 5—A series of views clustered to autom

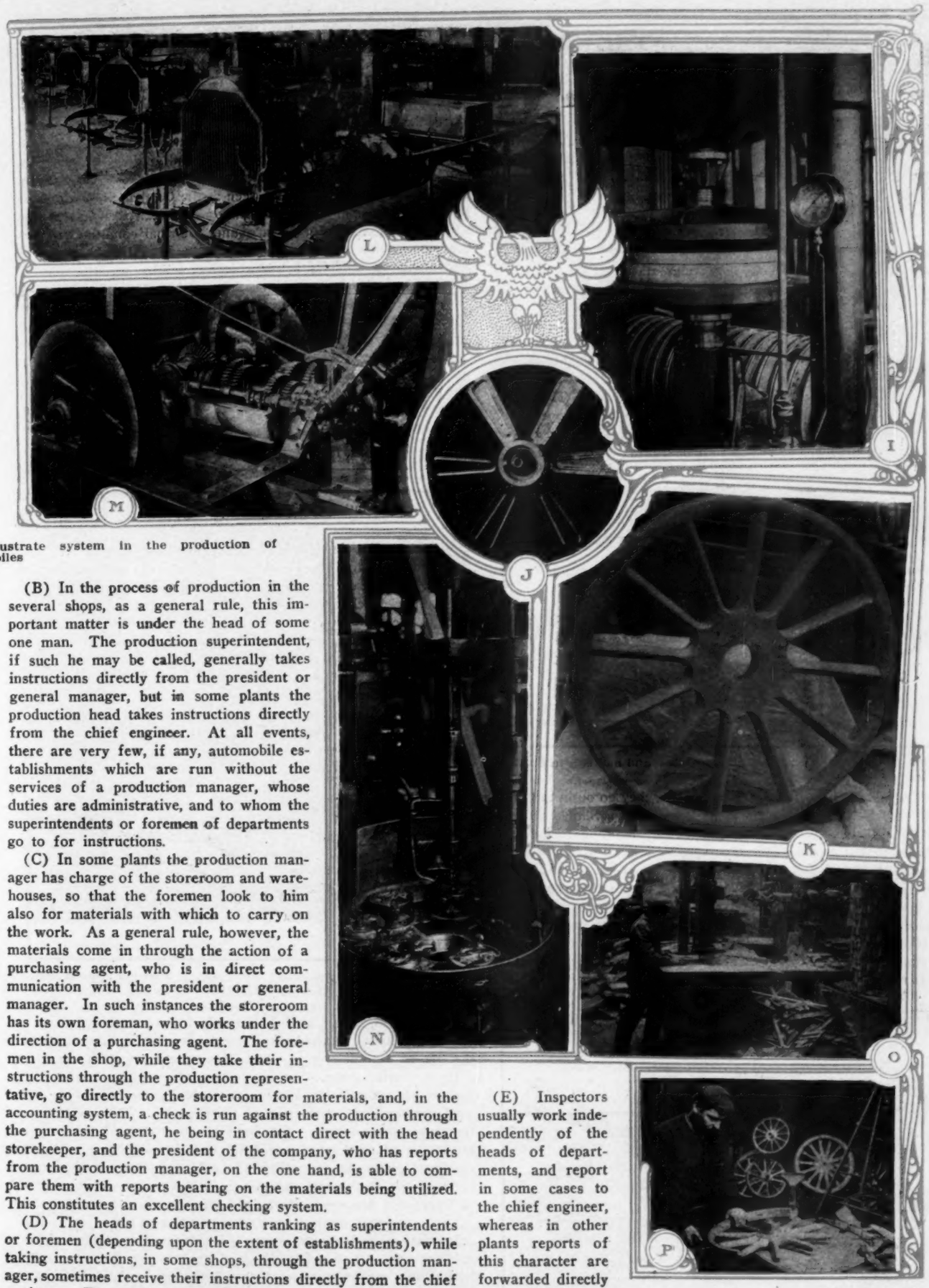
ufactured product shall be representative of, and express the will of, the board of directors. From the executive head rapid methods of intercommunications are necessary, and in the larger plants in which system is regarded as of vital importance communication is direct:

(A) To the chief engineer, who directs the forces in the designing office, and in some cases directly to the production department. In other plants communication is back to the source of all authority. In the Cadillac plant, at Detroit, for illustration, no move of any importance is made excepting as voiced by the president of the company, after a conference is held in which all the principal departments have representation. In other plants, for example, Chalmers-Detroit, drawings are sent out from the designing department directly to the production department through H. E. Coffin, chief engineer. In the Regal plant this question of system is handled in quite a novel way, in that the general manager is in direct communication with every department at all times. In this plant a chief engineer ranks as chief of the designing staff, under the direction of the general manager, and, while he has charge of designing in all its phases, he is, nevertheless, limited to just these functions, and drawings are moved out only in accordance with instructions which emanate from the general manager's office. As an exception, certain routine matters are handled automatically. The system in the Regal plant works extremely well, and, in proceeding, everything is done on a basis of 100 cars, representing a lot going through at one time. Every operation necessary to the completion of 100 cars is made in unison, and, if there is a laggard anywhere, he is smoked out, for the simple reason that the lockstep is broken. At 10 o'clock every morning the executive head is in full possession of information relative to weak spots only. Things which progress on time do not have to be investigated.

(O and P) Presents details in the process of making the woodwork of wheels, which was taken from foreign practice.

PRODUCTION

The grouping of the illustrations, as shown in Fig. 6, was made with the idea of indicating that there must be a definite connection between the executive head of the business office and the various production departments, in order that the man-



illustrate system in the production of obiles

(B) In the process of production in the several shops, as a general rule, this important matter is under the head of some one man. The production superintendent, if such he may be called, generally takes instructions directly from the president or general manager, but in some plants the production head takes instructions directly from the chief engineer. At all events, there are very few, if any, automobile establishments which are run without the services of a production manager, whose duties are administrative, and to whom the superintendents or foremen of departments go to for instructions.

(C) In some plants the production manager has charge of the storeroom and warehouses, so that the foremen look to him also for materials with which to carry on the work. As a general rule, however, the materials come in through the action of a purchasing agent, who is in direct communication with the president or general manager. In such instances the storeroom has its own foreman, who works under the direction of a purchasing agent. The foremen in the shop, while they take their instructions through the production representative, go directly to the storeroom for materials, and, in the accounting system, a check is run against the production through the purchasing agent, he being in contact direct with the head storekeeper, and the president of the company, who has reports from the production manager, on the one hand, is able to compare them with reports bearing on the materials being utilized. This constitutes an excellent checking system.

(D) The heads of departments ranking as superintendents or foremen (depending upon the extent of establishments), while taking instructions, in some shops, through the production manager, sometimes receive their instructions directly from the chief engineer. The production head, in such cases, becomes, as it were, a clerk, merely recording from day to day the work done, just as the timekeeper keeps track of the time put in by the men.

(E) Inspectors usually work independently of the heads of departments, and report in some cases to the chief engineer, whereas in other plants reports of this character are forwarded directly to the president or general manager. At all events it is the desire to maintain a certain independence of action of the inspecting force no matter how it is directed, to assure results.

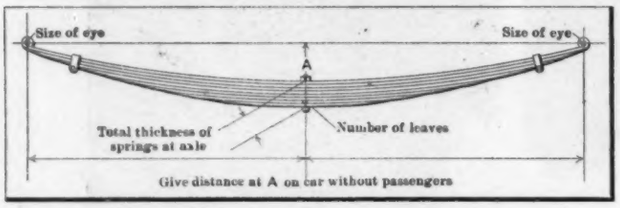


Fig. 6—Half elliptic spring, indicating data required by maker

It is now a fairly well established fact that quantity production on a quality basis is only possible under an operation inspection system. Interchangeability of parts, a factor present in all well-made automobiles, depends upon the accuracy of finishing of each individual piece, and not upon the mere fact that a unit as a motor or a transmission gear will run when it is made. This interchangeability depends entirely upon the inspection of operations, and in plants such as the Pierce-Arrow, for illustration, operation inspections require the services of from twenty-eight to thirty men and a room possibly 50x100 feet in area. All the work, as the operations are completed, must go into this room, be checked with the drawings, have records made, and go out again with

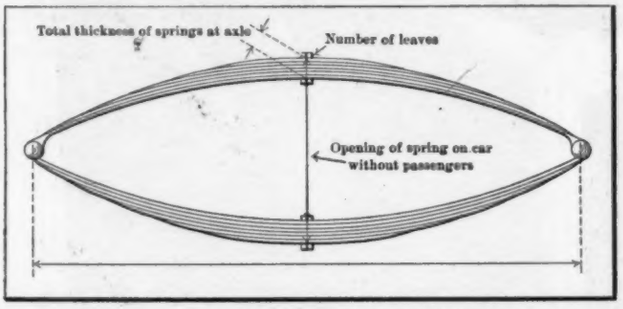


Fig. 7—Full elliptic spring, with forged eyes and maker's indications

such rapidity that successive operations, as they go on in the shop, will not be interrupted for a single moment. Should the inspectors fall behind in their work, the machine tools in the shop will be affected, and the cost of production will go up enormously, to say nothing of delays in delivery.

Besides parts inspection, involving the checking of the goods on every operation, the unit inspection and test is carried on in the several plants, utilizing special equipment and methods, but, as shown in Fig. 3, it is the idea to load the units to some predetermined excess beyond the normal rating, adjust the relating parts to a silent and free-running condition, and thereafter forward the assembled units to the final assembling department, where, after final assembling, further tests are made before the abuse or road test is taken up. These and many other carefully conducted details in the manufacturing process are reasons why automobiles, as they are to be seen at the Garden, are capable of sustaining under all the conditions of American roads, also why, after running for several years, under normal conditions of depreciation, they are in first-class shape, even though the care afforded them falls far below a desired level.

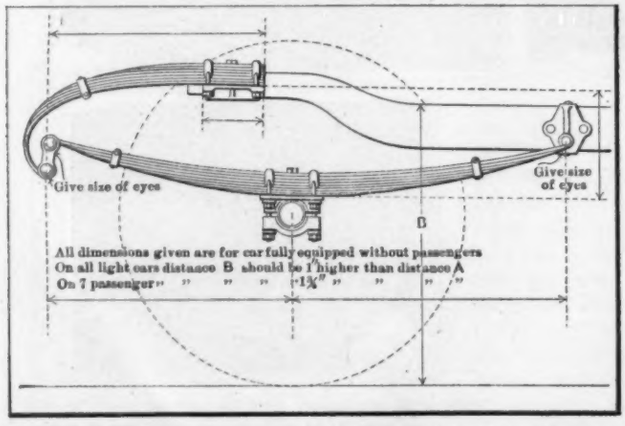

Give size of eyes
Give size of eyes
B
All dimensions given are for car fully equipped without passengers
On all light cars distance B should be 1" higher than distance A
On 7 passenger " " " " 1½" " " " "

Fig. 8—¾ elliptic scroll spring, showing methods of fastening and H-swivel for flexibility

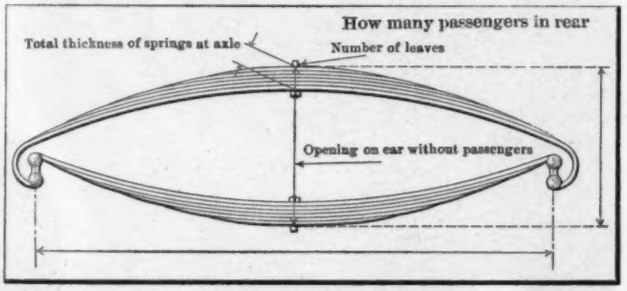


Fig. 9—Full elliptic scroll spring as used on rear suspensions to afford easy riding qualities, taking care of fore and aft oscillations

HIGH AVERAGE OF QUALITY IN PRODUCT

Just what is to be regarded as the particular advance of the year, when reference is made to the quality of the cars exhibited, is a matter which will have to be left to the patrons of this industry. Be it known, however, that an automobile, like a locomotive, is a kinetic machine, in that the stresses and strains partake of diagonal characteristics, whereas, in static work, there are no diagonal efforts, and gravity rules. Before automobile designing reached its present state of perfection it was suspected that the life of material would be shortened under kinetic conditions and that a crankshaft, for illustration, would disintegrate as surely as it revolved in its bearings after a certain time. The only question was, "how long will a crankshaft last?" Automo-

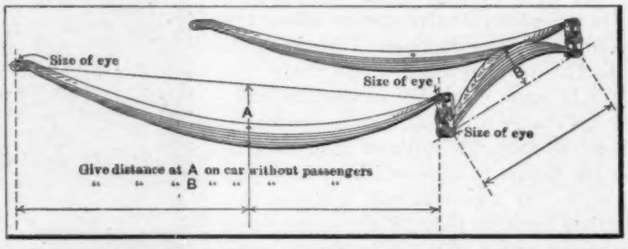


Fig. 10—Example of platform type of spring, showing cross member at rear; may be in front

bile engineers, after having devised divers forms of kinetic testing machines, reached many conclusions which now augment the life of automobiles in which these conclusions are reached.

In a kinetic sense, then, with two phases to consider, the makers of automobiles sought for highly kinetic material, and used the same to satisfy one of these phases. They went further when they designed for flexibility, a matter of the proper utilization of springs on one hand and the suitably placing of universal joints on the other. Equally important is the principle of the three-point suspension, which makes it impossible to transfer a torsional effort from one member to another.

THE SPRING SITUATION CLEARED UP

In the earlier efforts, many of which were copied from foreign cars which were designed to run on Roman roads, half elliptic springs were used, they being rather short, with narrow and relatively thick plates. When these cars were tried out under American conditions the vertical bounce was at a disagreeably high frequency in response to severe road con-

ditions. This reflected but a short pendulum action and a certain inherent inability on the part of the springs.

American designers naturally have had more experience with spring work under severe road conditions, and as soon as they decided to depart from foreign practice they entered upon the half-way which leads to success, and the automobiles which may now be seen have this success embodied in them.

Considering the springs in a general way in the cars of the present year, it will be found that half-elliptic types, when they are used, are pretty generally confined to the constant load conditions such as obtained at the front end, inasmuch as the motor and accessories represent probably 90 per cent. of the actual load carried on the front springs. This is particularly true this year, since the old idea of a "front overhang" has been eliminated, meaning that the radiator is either on the center line of the front axle or back of it. The radiator does not extend to the front of the front axle.

When half-elliptic springs are used at the rear—this being perfectly feasible without fostering trouble—the plates are wide, relatively thin, and there are so many of them that the

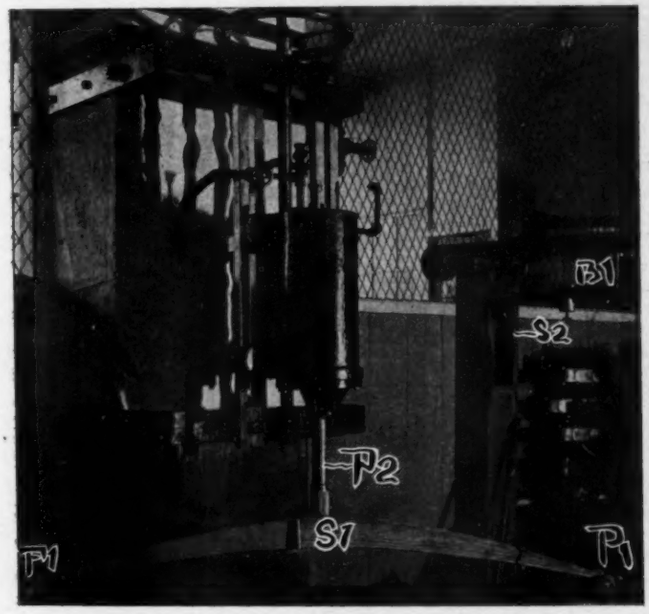


Fig. 11—Spring-testing machine, showing the spring before pressure is applied, and platform scales for registering

energy which has to be dissipated, represented in foot-pounds, is within the allowable limits. Consider now that it is well understood that the amount of steel required in the springs is at least one pound of material for five foot-pounds of energy dissipated. Fig. 6 represents the half-elliptical spring idea, and in all the spring illustrations as here afforded it is deemed a good idea to show how the spring-maker is informed as to the requirements, in order that he may do his work with certainty, conditions and the class of material covered by the specifications considered. These illustrations were taken from drawings which were placed at the disposal of the author by the Perfection Spring Company of Cleveland, Ohio.

Some designers prefer to interject additional flexibility to the spring suspension without having to use long spring plates. These resort to the use of full elliptic type of springs, as shown in Fig. 7. It has never been shown that the total weight of material used in the springs would be twice as much, merely because the full elliptic type is substituted for the half-elliptic form, and, as before stated, it seems to be necessary to use about a certain amount of spring material almost irrespective

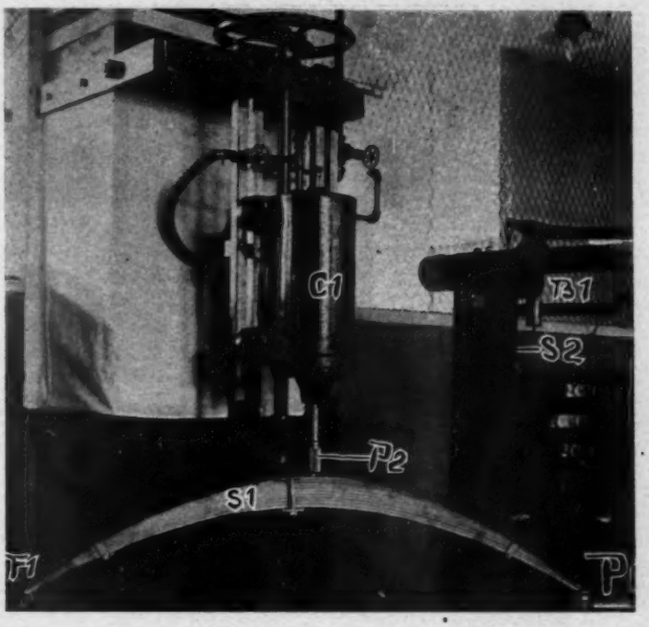


Fig. 12—Spring-testing machine, showing the spring depressed to the limit, and the scales recording the load

of the form. The license which designers take in utilizing full elliptic type of springs is justified, and if they prefer to use this same type at the front end as well as at the rear, it has its further justification as a matter of style.

FORE AND AFT OSCILLATIONS RECOGNIZED

The general introduction of scroll types of springs followed the recognition of fore and aft oscillations as well as vertical bounce. It was also considered that great flexibility in the vertical plane could be arrived at in two ways, i. e., (a) with long half-elliptic types of springs; (b) with scroll types of springs. It was found that very long half-elliptic type of springs required the use of extraordinary quality of materials, and even then the life of the members was uncertain. Some types were too short in many cases, due, in a measure, perhaps, to the adaptation of inferior grades of materials or to experimental products, which may not have proven to be good.

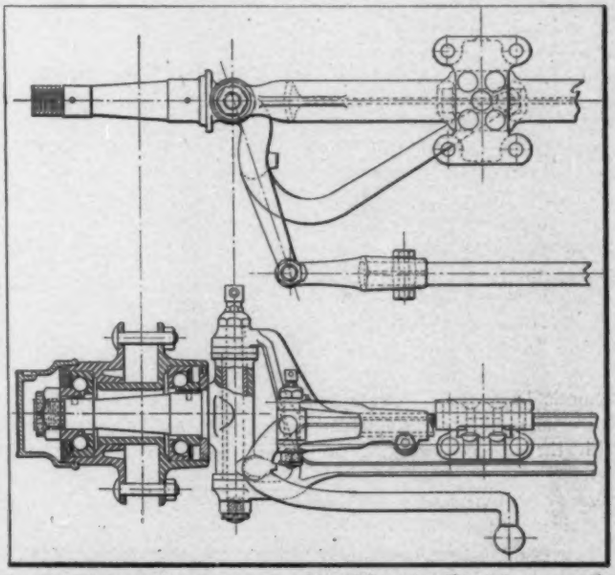


Fig. 13—High section front axle of the Waverley Electric, presenting a well-designed spring perch

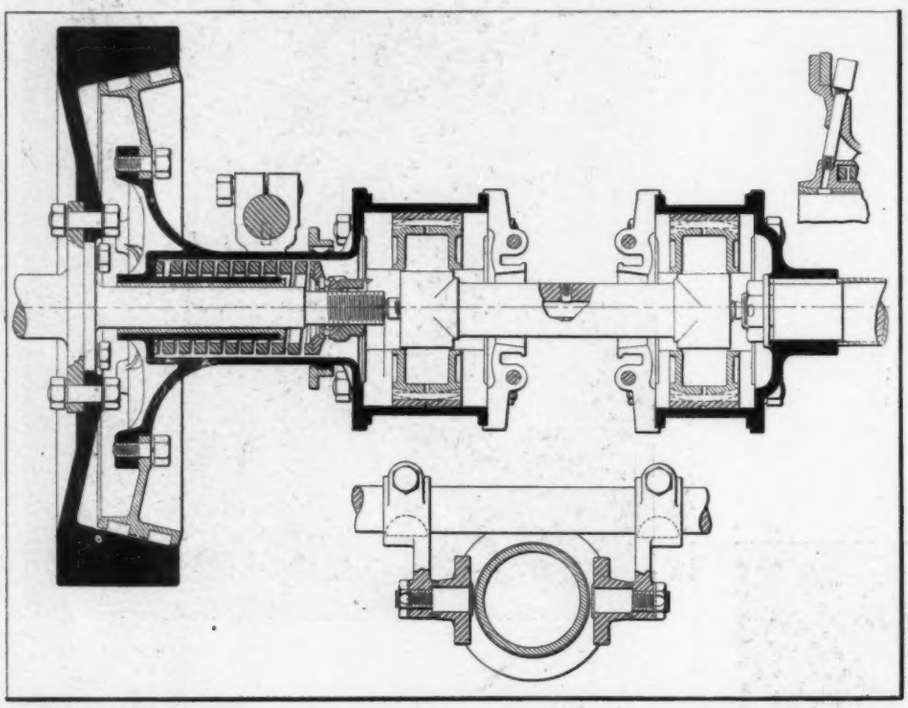


Fig. 14—Alden-Sampson cork insert type of cone clutch with full universal joint connection

Three-quarter elliptic scroll types of springs, as shown in Fig. 8, came into vogue in recognition of fore and aft oscillations and the desire for more easy-riding qualities, with a further expectation that the performance would be soft, and the pendulum effect would improve easy riding qualities. Experience seems to be in favor of the retention of these springs. In rear suspensions in particular full elliptic scroll types are used, they being substantially as shown in Fig. 9.

Platform types of springs, of which there has been a goodly sprinkling for several years, are still much in vogue. They represent extreme flexibility under severe conditions of service, and, in a measure, they are proof of the contention that it takes a certain amount of steel to do a certain amount of work, and realize a full measure of dynamic life of the material present. Fig. 10 illustrates the platform type of spring with the lateral member to the rear—a common practice, but not at all universal. The lateral member is sometimes placed to the front, but full platform types of springs are the exception rather than the rule.

ALLOY STEEL THE PRIME FAVORITE

Some of the earlier efforts, because they involve the use of open-hearth high-carbon steel, were a little less satisfactory than was the wont, brought about through the earlier practices in connection with animal-drawn vehicles. It was soon found that the service demanded of springs in automobile work was of a much more vigorous character than that of the drawn rig, and the kinetic life of the high-carbon steel fell short of the actual demand. In the A. L. A. M. laboratory, and under the direction of outside laboratories, it was ascertained that the kinetic life of steel decreased with increasing carbon, and was lower in embasic products than in acid steels.

With the introduction of vanadium, chromium, nickel and tungsten, under suitable conditions and in appropriate percentages, the fabricators of spring steel were enabled to increase kinetic life in a measure, due to lowering carbon, which was rendered feasible by the introduction of alloying elements.

In the springs, as they actually obtain in the cars which will be on show at the Garden, the generic types of steel may be set down as follows:

(A) Silico-manganese steel, in which the silicon runs about 1.6 per cent., but the manganese is not much higher than that which obtains in other steels of the same carbon content. In this type of steel the carbon covers around 60 points.

(B) Vanadium steel, in which the vanadium is held at a fairly low limit; 18 points or under, the carbon is maintained at substantially 60 points, and chromium may be present.

(C) A tri-alloy steel holding chromium nickel and tungsten with carbon at 60 points.

(D) Specification carbon steel, usually a basic product, with carbon regulated for 100 per cent. pearlite, when the steel is in the normal state. This steel is necessarily from pure ores, and the metalloids are maintained at .03 for sulphur and phosphorus as a maximum.

Spring makers in the manufacture of automobile springs, in view of the hard surface to which the springs are necessarily subjected are equipped in a most elaborate way, this equipment including special gas or oil furnaces provided for purposes of heat treatment, and temperature is regulated with great precision.

The spring plates selected are relatively thin, considering former

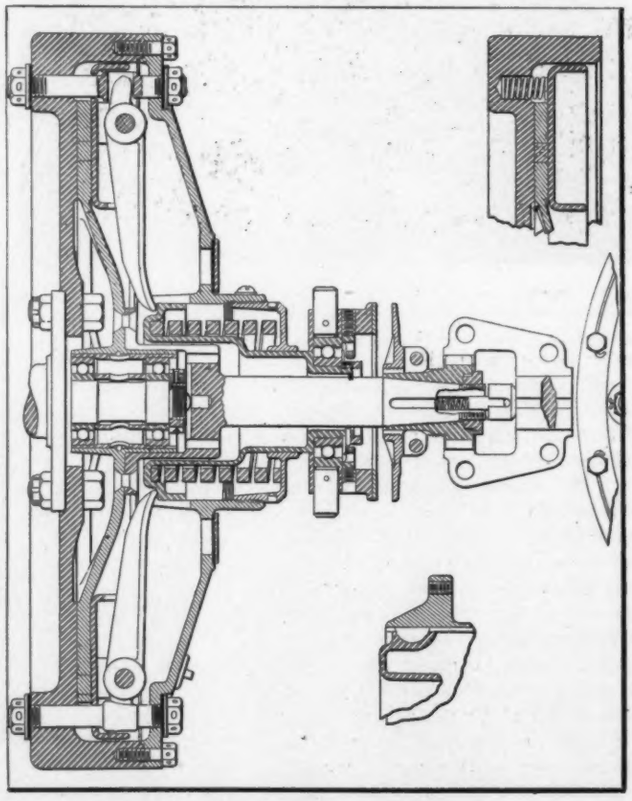


Fig. 15—Thomas flat plate clutch with cork inserts and adequate surface for service.

practice, and the width of the plates is also greater. It is the idea to so design the springs that they will dissipate the greatest possible amount of energy without increasing the fiber strain in the extreme section of the plates to a point which will endanger the life. Unfortunately, it is necessary to design springs so that the fiber strain will be relatively high under normal working conditions. For this reason spring makers have to design in such a way as to limit the increase in fiber strain which will follow when the springs are depressed. In a practical sense, the whole situation is simple enough, since the plan involves the use of wide plates, and the relatively increased number of them, which means thin plates, and these are bowed to a common radius, so that the fiber strain will be the same in every place under normal working conditions.

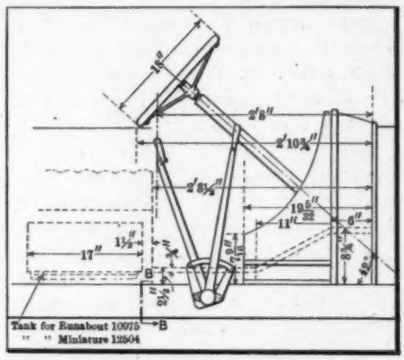


Fig. 17—Pierce-Arrow Runabout type, showing dimensions of body

As a rule the plates are rolled with round edges, and the flat surfaces are concave, so that the plates bear on their edges. This is an excellent idea, partly because it increases the pressure per square inch, and in some measure the friction, but it also affords pockets in which lubricating oil may hide, and, in accordance with the law of the flow of oil, it will migrate upwards to the high points and gradually feed lubricant to the pressure surfaces

SIZES OF FLAT PLATES USED IN SPRINGS

B. W. G. Numbers.	Thickness in Inches.
0	0.34
1	0.30
2	0.284
3	0.259
4	0.238
5	0.22

SPECIAL SPRING TESTING MACHINES DEVISED

Spring making is an empirical undertaking to a very considerable extent, and skill is necessary to a greater extent than might ordinarily be supposed. In automobile work, in view of the large number of cars turned out, and the importance of good springs, it was found desirable to supplement the personal judgment of the spring-maker by the introduction of testing machines, it being true that the personal equation in connection with the quantity undertaking influences for trouble. Fig. 11 shows a spring S1, on a fulcrum F1, for end of the spring and resting on the platform P1 at the other end of the spring. A hydraulic cylinder, C1, with its means of control, is centrally located so that the piston rod P2 presses against the center of the spring, and the amount of the pressure is recorded on the beam B1 of the scales S2. Fig. 12 shows that the spring S1, under pressure interpreted by the piston rod P2, is straightened out. The amount of deflection may be noted by suitable markings on the piston P2, and the pressure exerted at P1 will show on the beam B1 of the scales S2.

The method of control is perfectly simple, and the piston P2 moves down with great deliberation, thus enabling the inspector to arrive at a fair conclusion of the competence of the respective springs, he knowing beforehand how much they ought to deflect to satisfy the given conditions under which they are to operate. Systems of this character, varying in some slight particulars in different cases, were found in the various establishments devoted to the manufacture of springs, and the makers of automobiles, as a general rule, are equipped for testing springs also, these particular illustrations having been taken for the author at the Thomas plant in Buffalo.

SOME PRACTICAL CONSIDERATIONS FOR THE AUTOIST

In the cars with live rear axles the spring purchases are, as a rule, free to rotate. The springs, therefore, do not have to take a tortional effort of the live rear axle, and a matter of greatest importance in maintenance is to maintain a tight clamping of the springs to the purchase. Fig. 13, which is a front axle of a Waverley Electric, shows a perch with the wings for the U-bolts far enough out to enable the assembler to apply wrenches, and the pressure which may be exerted on the nuts of the U-bolts will therefore be sufficient for the purpose.

In almost every case a leather pad is skived to the proper curvature of the springs where they rest on the purchase (wood is sometimes used), and the pad thus placed serves a double purpose, in that it permits the U-bolts to be drawn up tightly, and, the coefficient friction of the leather or wood being far greater than that of metal to metal, the springs are clamped into secure relation.

DRY PLATE CLUTCHES USED THIS YEAR

While there is a general improvement in clutches all along the line, the fact remains that the one distinct advance, if such it may be called, is in the utilization of dry-plate clutches, of which the new Packard is an excellent illustration. This type of dry-plate clutch differs from multiple disc clutches primarily in the use of from five to eight plates, instead of from 40 to 60 thin discs. The plates are relatively thick, and the friction members are in the shape of "asbestos fabric," which is riveted on to the plates; lubricant is excluded. There are several advantages claimed for dry-plate clutches, among which is the self-evident fact that the bearing surfaces at the splines are much more liberal, and the plates will therefore remain free in their action. It is also said that they do not act "fierce," but that they take a hold gradually, bring the car to maximum speed smartly, and hold in hill climbing under the most severe conditions of surface.

Dry-disc clutches are, to some extent, as an evolution;

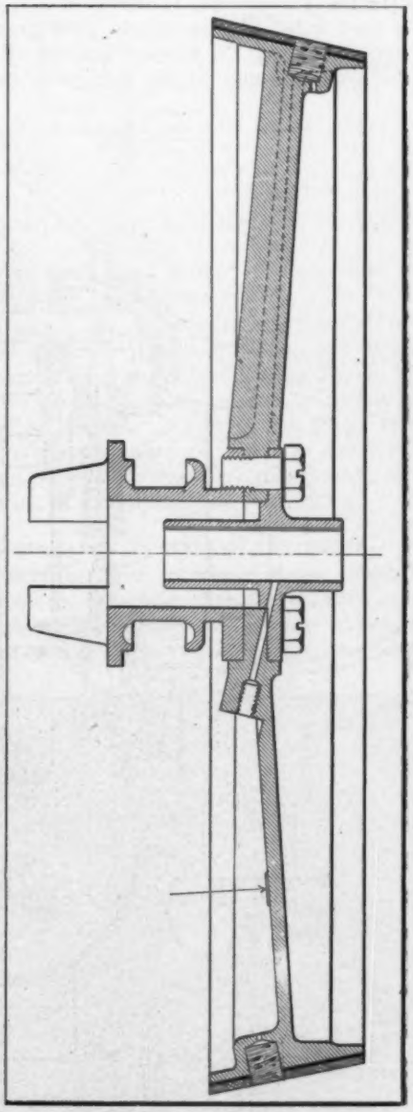


Fig. 18—Section of Pierce-Arrow cone clutch leather faced with cork

"cork inserts," as used in some types of clutches, offer substantially the same advantages, and the experience of several years with "cork-insert" clutches seemed to indicate that, in the long run, the absence of a lubricant eliminates a certain class of troubles. Fig. 14, which is the clutch assembly in the Alden-Sampson truck, shows a type of cork-insert clutch which has given excellent service under the severe conditions involved in trucking work, and it is true of this type of clutch that it is not rendered *hors du combat* if a little oil smears over the surface.

Incidentally, Fig. 14 shows some other details which throw light upon some other phases of the commercial problem, as, for illustration, the clutch spring is square and offers close to 1,000 pounds pressure in the engagement of the clutch. The crankshaft flange is of considerable diameter, and the flanging bolts are liberal in size. The bronze bearing on which the clutch is centered and rotates is very long, and a ball-thrust block takes the unbalanced portion of the spring pressure. Back of the thrust block a pair of universal joints transmit the power from the clutch to the transmission gear, and there is evidence of strength and symmetry at every point. This figure rather goes to show that the old stricture, to the effect that commercials were mere adaptations of pleasure cars, no longer holds.

In the Thomas car, as shown in Fig. 15, a three-plate clutch is used, aided by cork inserts. The general scheme of the design is such that the flywheel is faced off to form a bearing for the middle member in the three-plate system. This bearing is far out towards the rim and is relatively wide. The outer member of the plates, which interprets the cam action of the lever system, has an equivalent area, and is made quite thin so that the ills of inertia are eliminated. This clutch, as the suction drawing shows, is engaged through the good office of a stout, square section spring, rolls on annular-type ball bearings, and is adjustable in every way. One very excellent recommendation for this clutch lies in the length of time it has served.

Multiple disc types of clutches are just as much in vogue as in the past, having increased in a ratio which makes it possible to say that they are holding their own. It might even be proper to say that in the low powered cars, in particular, multiple disc types of clutches are well in the ascendency.

Cone clutches are very much improved in every way, they being lighter, hence less likely to impede the sliding of gears, which trouble was, in former times, the real objection to the cone type of clutch. Fig. 16, which represents the Pierce-Arrow cork insert cone clutch, shows a very light but stout design, a rather wide face, covered with clutch leather, and the row of cork inserts, they being staggered around the periphery, registering with the disc structure of the clutch. In this design it seems to be the idea to reduce weight in every possible way, and, as was ascertained in the A. L. A. M. laboratory, the thinner the aluminum the stronger it will be. This is one example of the great utility of aluminum in the hands of competent designers. This material is initially rigid, which is a desirable clutch spider characteristic, and it is amply strong for the purpose, when it is properly dished and suitably ribbed. The inertia of the moving mass is reduced to a low ebb, due to the small value of the specific weight of aluminum as it is alloyed for clutch-spider work, and, coupling this design with a well-directed angle of the cone face, considering the use of a proper grade of friction leather, supplemented by cork inserts, it was a matter of no moment at all as to whether oil smears over the faces, nor will the clutch act "fierce."

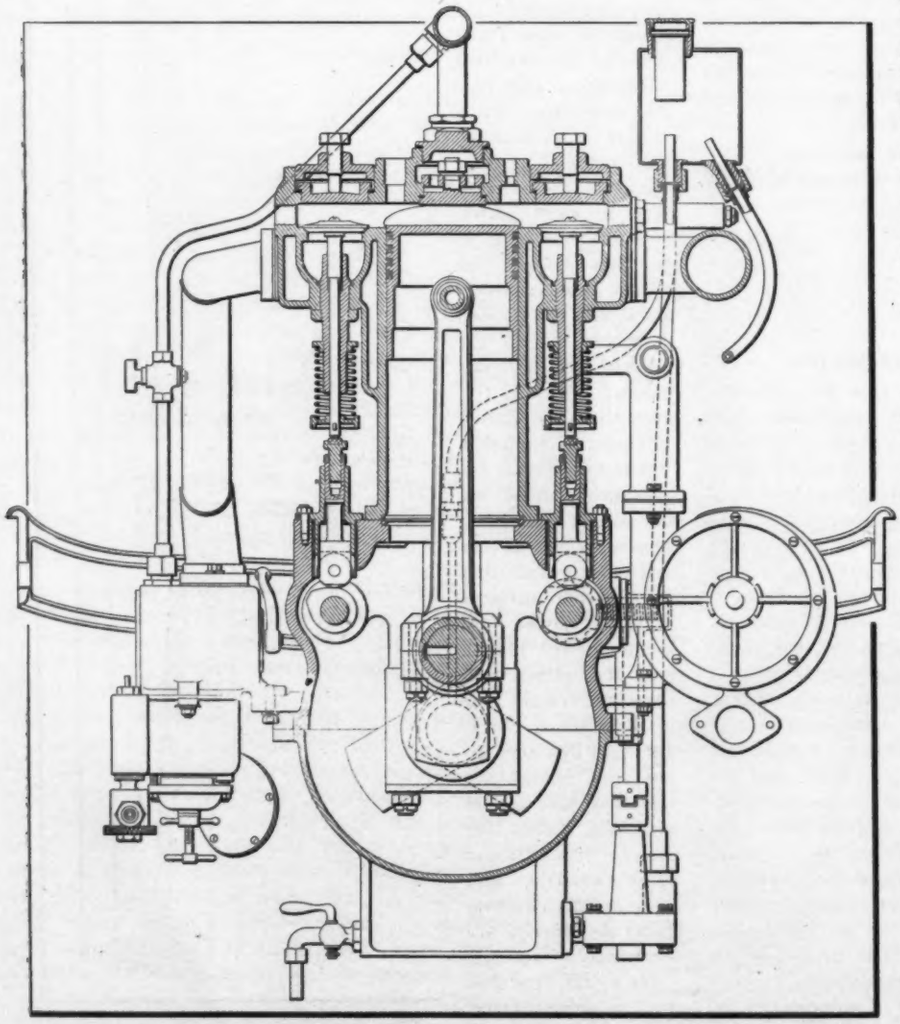


Fig. 18—Section of a Pierce-Arrow motor presented to illustrate location of oil basin in the basement of the crankcase

MOTOR DESIGNS ON A STABLE BASIS

Perhaps it will be of the first importance to point out that, to a very considerable extent, gray cast iron is being used in motor cases, especially in the smaller sizes of motors, to the exclusion of aluminum. This departure from a former fixed practice is due in some measure to uncertainties in aluminum, and again to the improvements wrought in gray iron work, which permits of the use of relatively thin castings, so that, for a given weight, it is actually possible to substitute cast iron, although its specific weight is approximately three times.

In the larger and more pretentious automobiles it is still the custom to use aluminum, and this material probably will be continued, certainly until something better is found, but every effort is made to employ pure grades of aluminum in the process, eliminating scrap, and preventing contamination in the foundry. The shapes of crank cases in silent-performing cars are looked after with the utmost care, and thick walls are used to prevent noise. Cylinder castings are now so thoroughly well made, and of such fine grades of material, that the results are thoroughly good.

· PRECISION · IN · PRODUCTION · THE · THEME ·

·By·Thos·J·Fay·

ASSOCIATION for the common good which is the idea of the A.L.A.M., must, if anything, lead to precision of production, which, if it results in standardization of manufacture, ends in interchangeability of parts. Quality, under such conditions, will be at a fair price. This question of quality, as it relates to price, is a matter of the gravest concern, inasmuch as a machine may be extremely high in price, yet low in the scale of utility, showing that price is not all.

If the methods in vogue in a shop obtain in the absence of suitable instruments of precision, or, if the machine tools are of an antiquated vintage, then bench hands will have to be depended upon for results, and, while these may be men of skill and judgment, still they will not be on an exact par with each other, and the output from them will fall below any reasonable standard, even under conditions of liberal limits of tolerance.

If the machine tools are of the class which once served very well, so to speak, in the manufacture of machinery of the kind built up principally of cast gray iron, with perhaps machine steel as the hardest material to work up, then the tools will not be sufficiently rigid for the newer work, and accuracy will fall off in proportion as the tools deflect under the work.

VERBAL ORDERS DON'T GO

E. R. THOMAS MOTOR CO. OFFICE MEMO

File 100

From Laboratory Dept. to Engineering Dept. Date May 19, 1909

Attention Mr. McComb Subject

Clearance volumes measured by Mr. Rees for the "E" motor, in absence of the writer, gave the following results:

Cylinder No.1	37.2	cu in.	or	19.25%	of total volume
" " 2	37.5	"	"	19.36%	" " "
" " 3	34.5	"	"	17.78%	" " "
" " 4	37.8	"	"	19.52%	" " "

Should not be surprised that preignition would occur with clearance volume as small as this. Would say that 17% clearance volume, if other conditions were right, we should get a compression of about 110 lbs. per square inch.

Reply

JTH J. H. Gould

COVED

NOTE.—Where replies are required original and duplicate copies are to be sent. Party receiving memo will note reply on original and return it retaining the duplicate for filing. An additional memo copy may be made and held until reply is received.

Fig. 1—Form of laboratory report used in E. R. Thomas plant to assure precision

If instead of a laboratory, rule of thumb methods have to be relied upon, it follows that the materials purchased will be up to the standard of the furnisher thereof and it may be that this standard will be lower than the aspirations of the purchaser.

If the designer of an automobile or parts locks himself up in a room; fails to take heed of the progress being made around him; inveigles himself into the belief that he has a monopoly of brains, and endeavors to purchase all the "cardinal virtues" in the simple process of paying workmen $15 per week to do his bidding—it is not supposable that the automobiles, if such they may be called, will compare favorably with the class designed and built after the undertaking has had the advantage of the enlightenment emanating from associated engineers, who, in turn, must satisfy the business establishment in all essential particulars.

INDIVIDUALITY IS NOT STIFLED IN THE PROCESS

The willing horse, the genius, and the innovator, all representing the graces of the engineering office, will still be there, and they, being irrepressible, will chafe in gear until their claims of better things find a safe abiding place in the maw of the management, and it is not likely that a real improvement can be resisted for long. In combining effort, it is possible to see advantage, especially when reference is had to innovations, for by this very association the members are enabled to keep abreast of the situation; feel the pulse of the supporters; determine merit, and ascertain the best way to launch a new idea.

In view of the close association of the exhibitors (the Association of Licensed Automobile Manufacturers), and in connection with a comprehensive discussion of the automobiles, as they will appear in Madison Square Garden, New York, it will be more to the point to review methods in vogue in the shops, taking an example here and there, rather than to write about some one shop. In this way, there can be presented a "birdseye view," reflecting, in measure, the inherent qualities of the products as a whole, leaving it to purchasers to ascertain for themselves the particular points of merit in the respective cars which appeal most to them.

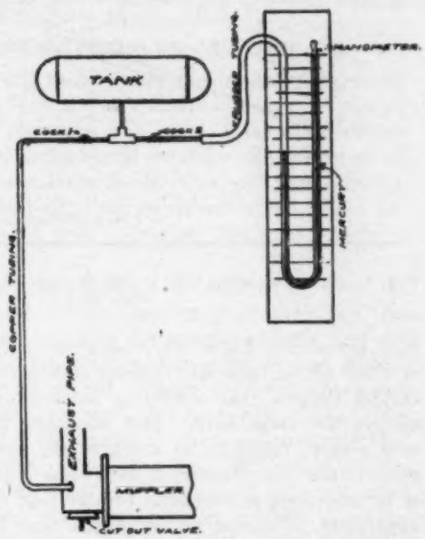


Fig. 3—Plan contrived to test mufflers on the road under regular conditions of service

SOME EVIDENCES

In order to fully appreciate the advantages of association, it will be necessary to illustrate clearly the points to be made. Table I affords enlightenment as to the front area of radiators as they are used on several of the well-known makes of automobiles, this data having been compiled in the laboratory of the E. R. Thomas Motor Companv, Buffalo, N. Y. In order to keep out confusion, in this laboratory, all orders are given in writing and answers must also be in writing. One is reproduced here in Fig. 1. This report, requiring no further explanation, holds information of a character which should be noted. It reveals two things to the reader, one of which is that the clearance volume in motor cylinders, unless they are most carefully made, will not be alike in all. In addition, the question of pre-ignition is a live matter.

EFFECT OF ANNEALING ON SIZES OF CYLINDERS

In annealing cylinders, in order to relieve strains which are likely to reside in them as they come from the foundry, a new source of trouble confronts the designer, and in order to ascertain the extent of deformation in the annealing process the test, as

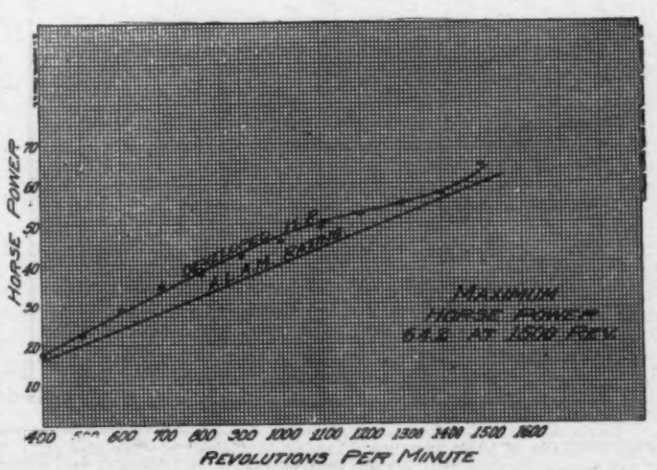


Fig. 2—Model M Thomas motor which exceeds A.L.A.M. rating as the curve shows

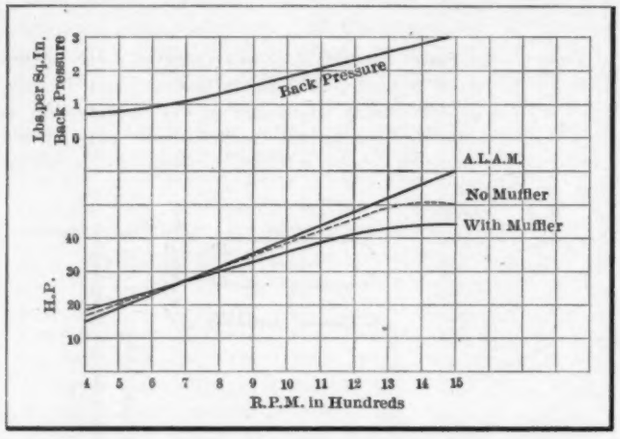


Fig. 4—Curve showing how curve of back pressure falls away under high speed

here given (see Table II), was made in the Thomas laboratory. A study of the table will disclose considerable variations, and the results suggest that annealing must be done before cylinders receive the finish bore. This annealing process, as the author now sees it, indicates to a degree the extent to which internal strains reside in cylinders as they come from the foundry. If this is so, annealing is necessary for the best results, it being proper, apparently, to choose the propitious time for the process.

THOMAS MODEL "M" MOTOR PERFORMANCE

Perhaps there is no better illustration of the value of exact methods than that of the curve of performance of the Mdoel "M" Thomas motor, in which, as the curve Fig. 2 shows, the power of the motor, which is a "six," exceeds the A.L.A.M. rating at all points in the speed range between 400 and 1,500 revolutions per minute. The same curve also shows an upward tendency from 1,400 to beyond 1,500 revolutions, and it would be interesting to have the results of a further investigation of this phase of the test; perhaps the results may be had at some later date, when the carbureter problem is followed to its ultimate conclusion, it being the case, in all probability, that the change noted (in the curve) is one involving carburetion.

INVESTIGATING BACK PRESSURE IN MUFFLERS

If a pound per square inch is equal and opposite to a pound per square inch of back pressure, this back pressure, due to the use of a muffler, is a very serious matter, and the Thomas company, appreciating this, investigated quite a number of mufflers for the purpose of finding a solution to the difficulty. One very interesting test, made with a car on the road, required the use of an equipment, a diagram of which is given as Fig 3, and the report of the engineer who conducted the test:

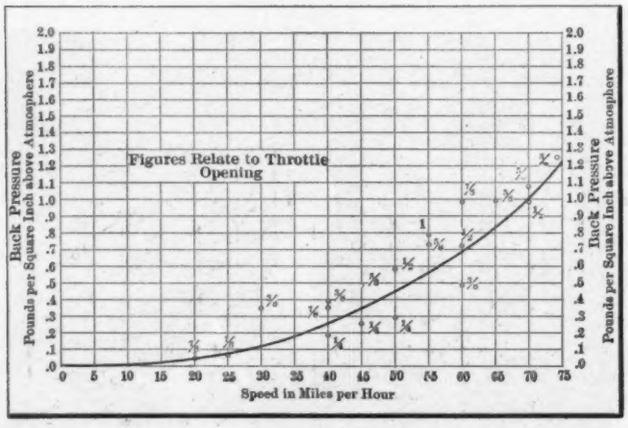


Fig. 5—Curve of back pressure when an inefficient muffler was substituted for that of Fig. 4

TEST OF A REED EJECTOR MUFFLER

"This special Reed ejector muffler has been used on all the K cars since August. One of the load test cars was fitted with a small pressure tank and manometer, as shown in Fig. 3, and in the top of the body of the muffler cutout a small hole was drilled and tapped for 1-8-inch pipe union. A 5-16-inch O. D. copper tube was used to connect the muffler to the tank. Proper valves were provided, as shown, and the manometer mounted vertically on the dash. Mercury was used as a means of measuring the pressure, the manometer back being calibrated to read inches. The object of using the tank was to act as a reservoir until the pressure could be measured. The car was equipped with a Warner 100-miles-per-hour speedometer. The throttle quadrant was graduated into eight divisions so as to form an index of throttle openings.

"The tests were made near Williamsville. With a given throttle opening when the car had arrived at a certain speed and had remained so from 30 to 40 seconds, the valve was turned off, thus entrapping the gas in the tank at the same pressure that had previously existed in the exhaust chamber during test. The car was then brought to a stop and reading of the manometer taken. The different speeds with constant throttle opening were obtained by either running the car uphill or holding it down with the brakes. Tests were made at every eighth until full throttle was reached. Similar tests were made with the muffler cutout to bring out the difference in performance."

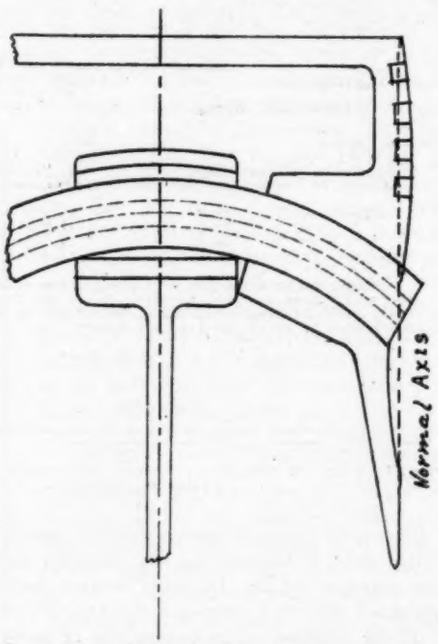


Fig. 6—Diagram devised to show how pistons deform when pressure is applied

As one of mercury equals 0.49 pound per square inch, then, by multiplying the manometer reading by this factor, we reduce to pounds per square inch.

From the data obtained curves were drawn, and it will be seen that the back pressure depends upon the throttle opening (*i.e.*, the amount of gas passing) as well as upon the velocity. Fig. 4 shows that 73 miles per hour for 3-4 opening, the curve rounds over. At this speed the car was running downhill. The engine speed was so high that the combustion was imperfect, thus producing less exhaust pressure.

The car was driven on high gear during tests:

Bevel pinion on main drive shaft.....30 teeth.
Bevel gear on jackshaft .....45 teeth.
Drive sprockets .....30 teeth.
Driven sprockets .....48 teeth.

which makes the gear ratio 2.4 to 1.

"It will be noticed that the first position for curves, 1-8, 1-4 and 3-8, are low, which would bring the intersection of the curve with the speed axis at a point before zero. As to whether this is correct or not, cannot be determined without further testing.

"With the muffler cutout data obtained curves have been plotted and a curve showing in a very general way the increase of back pressure with increase of speed due to opening the throttle on the level."

MUFFLER DEPRESSES POWER DELIVERY

By conducting a series of experiments on various types of mufflers in connection with a Thomas motor, it developed that power is materially reduced if the muffler offers much back pressure, and Fig. 5 is a curve of results of one of these experiments made by using a somewhat inefficient muffler for the purpose. Fig. 2 was given to prove that Thomas results are better than A.L.A.M. ratings, whereas Fig. 5 presents contrary evidence in that the power delivered by the particular motor used in this test fell well below the A.L.A.M. rating when the back pressure due to the muffler used was increased, whereas the Reed ejector muffler regularly used in Thomas work offered no such resistance to the flow of the exhaust.

Table III, which is given in this article, shows some of the series of readings taken in the road test, from which the curve Fig. 4 was plotted. This series of data will help materially in the process of following up the test, especially if the reader is not skilled in such reading diagrams as Fig. 4.

PISTON DEFORMATION UNDER LOAD CONDITIONS

Considering perfection of design of automobile motors the end is not as yet, and this is to be looked upon as a hopeful sign rather than with a despairing eye. In order, however, to advance the work, facilities, inclination, and time in which to accomplish the tedious tasks must be available. As an indication of the underlying situation, refer to Fig. 6, which shows, theoretically, and in an accentuated manner, how pistons do deform in service, and, as to the extent of this deformation, it is enough to examine Table IV, connected with the report of the test, in conjunction with the report of J. M. L. Howe, of the E. R. Thomas staff, as follows:

HOWE REPORT OF PISTON DEFORMATION

The idea in this test was to determine under various loads the distortion of the piston from a true cylindrical form. A straight ground piston of .003 clearance was used and measurements taken as follows, both at an angle and parallel to the piston pin of the four bridges, and space between clearance and fourth bridge. The lower portion of the piston was measured in two places, *i.e.*, near the top and near the web. Wristpin clearance groove is 1-2 inch.

A wristpin and straight connecting rod were used. Then the crankshaft bushing on the rod (a short piece of shafting) was slipped and box tightened up. The piston and rod were next put under a 30-ton hydraulic press, the piston being up and a piece of blotting paper being interposed between the piston head and the plunger. The shafting was supported by two V blocks. Care was taken that the axis of the combined piston and rod coincided with that of the plunger. This is a fine illustration of the futility of theorizing in a garret and building on paper; it takes facilities, experience and persistence if the product is to be thoroughly good in every way.

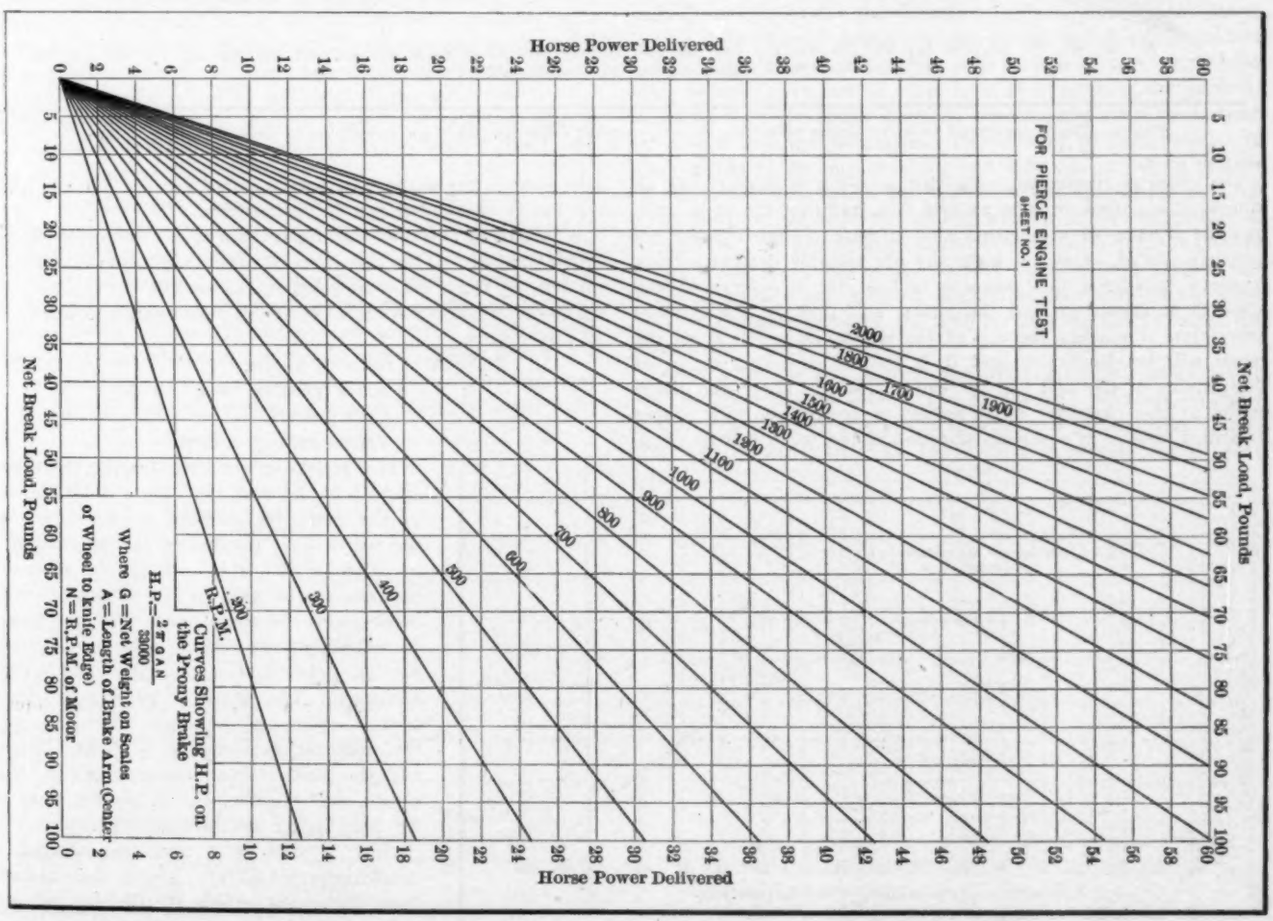


Fig. 7—Chart contrived for convenience in testing motors, showing horsepower at various speeds and brake loads

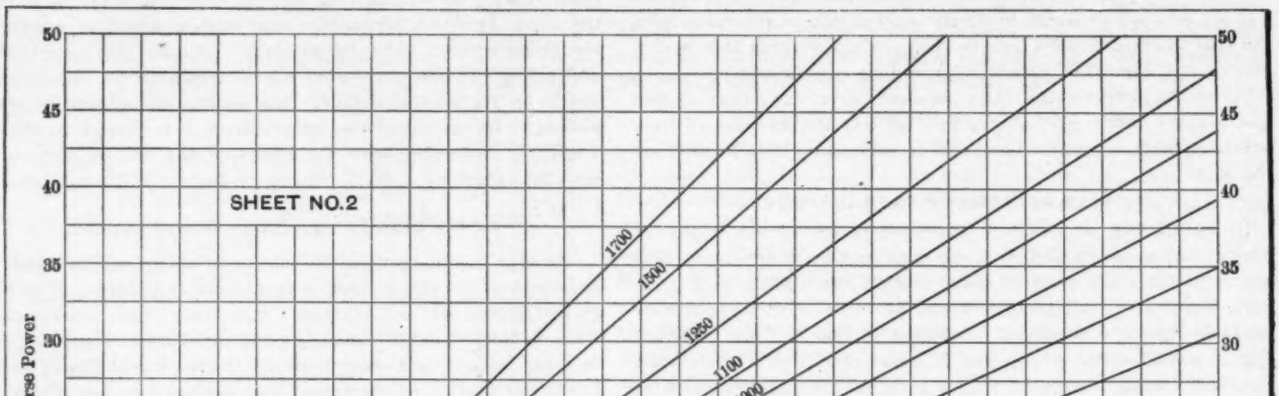


Fig. 8—Chart contrived to show mean effective pressure under different loads as measured in indicated horsepower

The claim is frequently made that a piston is lighter than all others; it is ribbed, or it is without ribs, and that the fit is within some fraction of a thousandth of an inch. If the ribs are not properly placed, or if the walls are not suitably designed, there is every likelihood that warping will be far in excess of any allowed fit allowance and the piston will stick in the cylinder every time it reaches the top of the stroke, in which event the result will be disastrous, and it is in this way that many of the failures of the past can be readily traced. There are divers points of this character to be settled in connection with proper designing, and it is a serious question if the work can be properly done in the absence of tools devised for the purpose and in the hands of men of proven competence.

A weight of two tons was applied and piston measured up while under pressure. This gives the maximum explosion load approximately as from the manograph cards on the "L" motor. The maximum explosive force was from 375-400 pounds to square inch of piston area.

$P_m \times A$ = force of piston.
= 400 x 3.625^2 x .7854.
= 4,140 pounds.
= approximately 2 tons.

The results are shown on the data sheet. It will be noticed that the cylindrical form of the piston is changed to an ellipse with the major axis parallel to the piston pin, or, in other words, the axis of the piston pin and the major axis of the ellipse lie in the same plane for above pin. The greatest deformation of decreased diameter occurs at portion between fourth bridge and wristpin clearance. The positive deformation lessens from here to top of piston. In space below clearance the deformation is slightly negative and the axis of the deformation has swung to one side slightly, but at portion near web the axis again assumes parallelism.

Next, a load of 5 tons was applied and measurements taken. These measurements show the characteristic distribution as previously given, but are increased about directly proportional to the load, *i.e.*, 2 to 5.

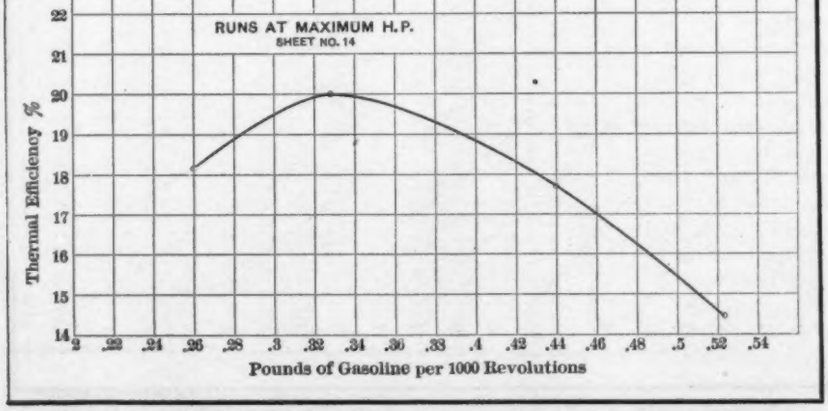


Fig. 9—Curve of thermal efficiency with a motor running at maximum load in horsepower and a speed of 1,000 revolutions per minute

The pressure was next carried up until the connecting rod collapsed, as shown. The pressure was approximately 7 tons, which gives a factor of safety of 3 1-2. The rod failed at what is known as the "square"-ended column failure," which means that the two ends were fixed in contrast to a pin-ended column. The connecting rod, if it had failed in a plane at right angles to the piston pin, would have failed in a "pin-ended column." It is a peculiar fact that the square-ended column is four times as strong as a pin-ended one. The failure in actual practice, if these excessive pressures were used, might lie in a plane at right angles to the present failure, due to the whipping or inertia forces which are added to the piston load.

The permanent deformation of the piston is given. It will be noticed that the major axis now runs at right angles to the pin. On taking the wrist pin out it was found to be bowed upwards approximately .02 inch. The wrist pin is made of 3-4-inch x 3-16-inch wall steel tubing, 3 7-16 inches long, hardened and ground down to .7192 inch.

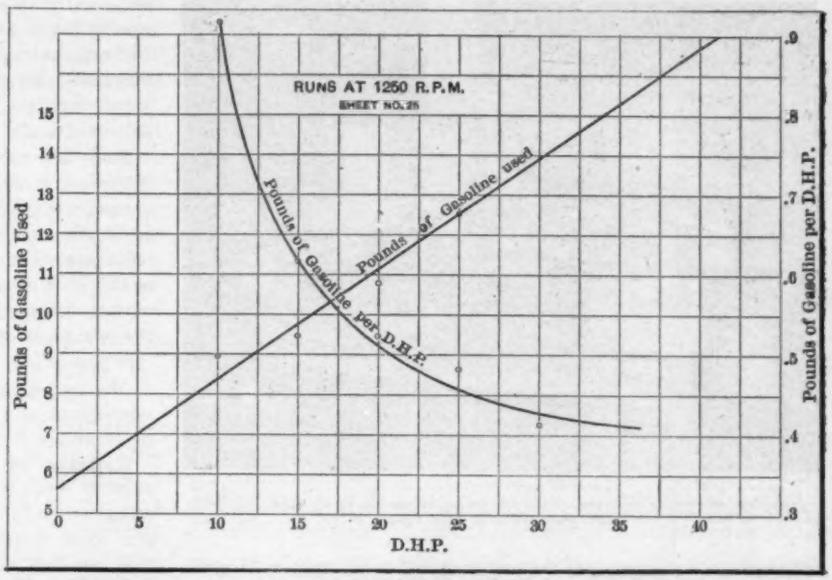


Fig. 10—Curve showing fuel per delivered horsepower and total fuel used under different conditions of power

For a theoretical consideration on strength of wrist pin, the custom is to treat it as a beam held at both ends and loaded at the middle instead of by a uniform load. The reason for the deformation is shown by the following sketch. As the piston pin bends, the walls of the piston, being very light, are forced outwards, and the walls below the pin inwards. As tests have been made on the heating of the "L" cylinder and piston, and these tests have shown that there is no appreciable deformation, the cause of scoring is due to weakness of the wrist pin.

Proper webbing in plane at right angles and perpendicular to pin across head and following down to bosses would greatly decrease deformation.

WITHIN THE PIERCE-ARROW LABORATORY

While there is a certain similarity between the laboratories in the several automobile plants, it remains that severally specialized methods prevail in them to a vast extent. As to these methods much depends upon the progress previously made and there is something to be attached to the objects sought. Characteristic of the line of investigation conducted in the Pierce laboratory, or in connection therewith, is the system of motor investigations pursued for the express purpose of ascertaining the exact facts in relation to fuel economy, power of range and flexibility.

Referring to Fig. 7, which is a curve plotted to show horsepower on the Prony brake, it will be observed that by a series of diagonal lines, each one of which represents some one speed of the motor, they, in conjunction with ordinates reading "net brake load in pounds" and "abscissa," afford a means for determining the horsepower of the motor at any one of the respective speeds when the net brake load in pounds is known. Referring again to the figure and to a net load of 90 pounds, the point of intersection of the speed diagonal representing 1,100 revolutions per minute is at the abscissa line representing 60 horsepower. In other words, if the motor during test shows a pull of 90 pounds on the brake arm when the speed of the crankshaft is 1,100 revolutions per minute, the motor will be delivering 60 actual horsepower. By proceeding as above for any other pull in pounds at any other speed the actual horsepower delivered may be determined quickly and without calculation, the chart being sufficiently extended to cover the whole range of performance for any motor.

When a manograph is used for the purpose of investigating the condition of the motor, the manograph readings, suitably interpreted, may be resolved into indicated horsepower. However, this information is of small value in the absence of more

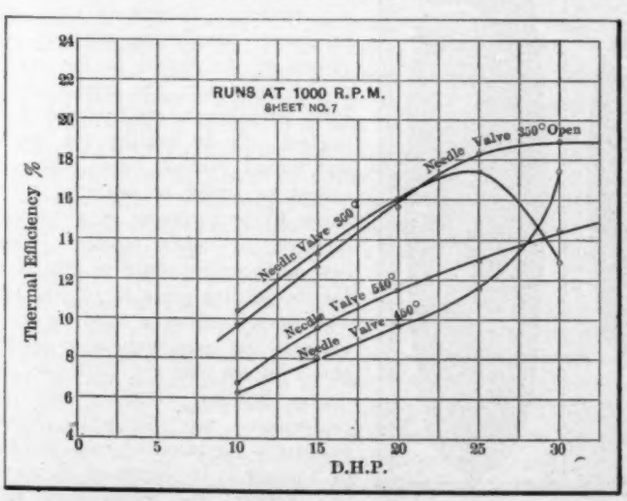


Fig. 11—Series of curves showing performance at different needle valve adjustments and effect on thermal efficiency

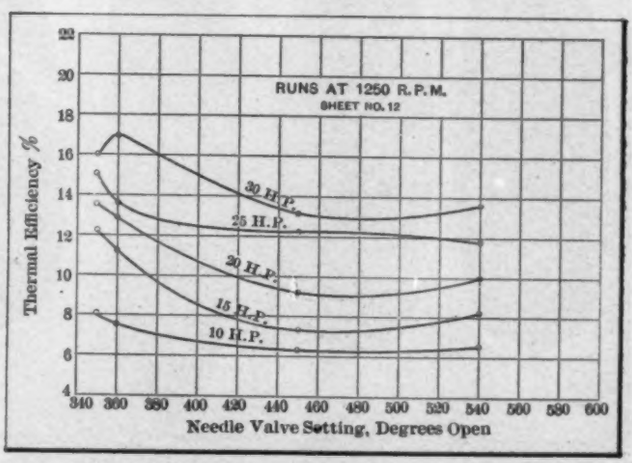


Fig. 12—Thermal efficiency under different conditions of carburetion and for different conditions of power

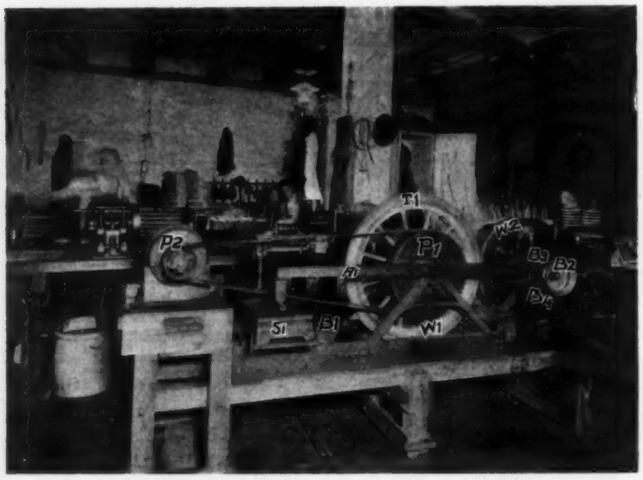


Fig. 13—Tire-testing machine as used in the Woods plant at Chicago for testing out tires

or less exact knowledge of the pumping losses in a motor. Figure 8 was contrived for convenience in testing Peerless motors. This chart will give, at a glance, the mean effective pressure in pounds per square inch, provided the indicated horsepower is known and by considering the speed of the motor at which the power may have been developed. The diagonal lines represent crankshaft speeds and the abscissa are given in terms of horsepower so that the mean effective pressure will be found as ordinates in the chart. Taking 40 horsepower for illustration, and following out to the point of intersection of the diagonal line representing 1,250 revolutions per minute, it will be found that the ordinate has a value of 440 which is given as mean effective pressure in pounds per square inch.

High Thermal Efficiency Ascertained—Perhaps Fig. 9 will show a condition which is beyond the belief of the old time engineer, who may not have followed closely investigations which were conducted by automobile engineers within the last ten years. As the chart shows, the curve of thermal efficiency, under conditions of maximum power for the particular motor, is maximum at 20 per cent. with the gasoline consumption at about .326 pound per 1,000 revolutions of the crankshaft. This thermal efficiency was unheard of in any other type of power-delivering machine and was not approached in internal combustion motors until refinements were made in automobile types—unless it be remembered that the Diesel type of internal combustion motor has delivered some noteworthy results.

Since the motor in this test was run at maximum power, it follows that the thermal efficiency varied with the gasoline consumption, bringing out very clearly the information which should be of the most use to the average autoist, *i.e.*, that there is only one right mixture, and that fuel economy is maximum when the motor is delivering its best power. This curve gives a wide range of fuel consumption, showing that the thermal efficiency fell to the low level of 14 1-2 per cent. when the fuel consumption was .532 pound per 1,000 revolutions; the thermal efficiency fell away as the amount of fuel used decreased below .325 pound per 1,000 revolutions and a decrease in thermal efficiency when the fuel is in excess or if the mixture is weak.

Relation of Gasoline Used to Fuel Economy—In still another test conducted on the same Pierce motor the data when tabulated and then plotted on a curve as shown in Fig. 10, brought out some interesting points involving the relation of the total fuel used to the gasoline per horsepower. The curved line in this chart reads "pounds of gasoline per delivered horsepower" and the amount of gasoline used decreased as the power of the motor increased, so that, considering a constant speed of 1,250 revolutions per minute, the least amount of fuel per horsepower was found when the power increased beyond 35 horsepower. The straight line in the curve shows that the gasoline consumption increased as the power of the motor increased. This is as it should be, but the point is made here in effect that the position of the diagonal line in the curve is very materially influenced by the decreasing rate of fuel consumption with increasing power.

Influence of Carburetor Needle Valve—Before departing from this phase of the subject, it will be the purpose here to reflect something more which can be construed as having a practical value to the average autoist. A needle valve when placed in the nozzle of a carburetor is there for the purpose of regulating the flow of gasoline. Through its agency the mixture can be made rich or lean at will. It frequently transpires that autoists find themselves in deep water after making a needle valve adjustment. They probably fail to appreciate just what it means to alter the relation of gasoline to air. Furthermore, it has been found that mere discussion falls short of the necessary explanation.

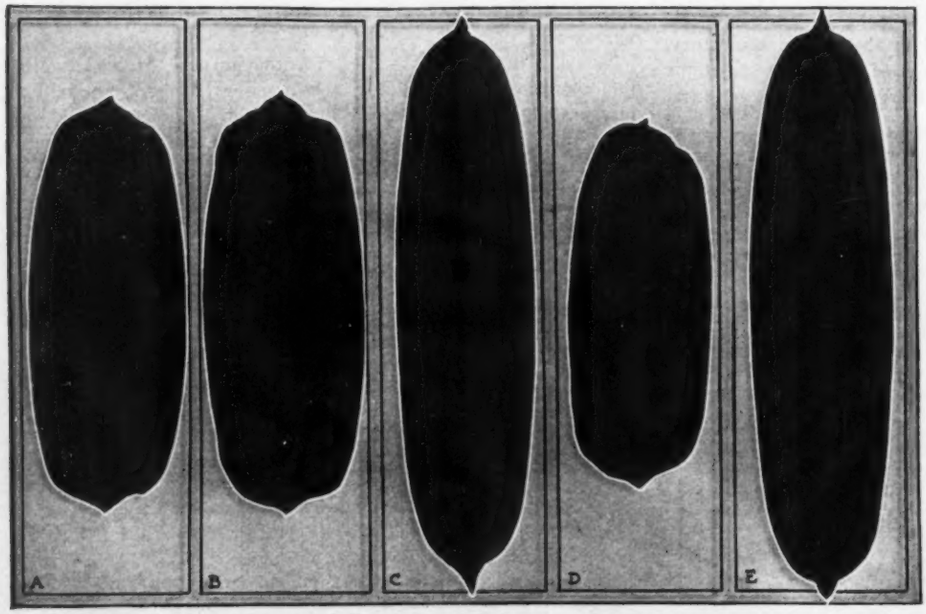


Fig. 14—Presents a set of records from the Woods tire-testing machine, giving information as to contact area under different conditions

Fig. 11 shows variations in thermal efficiency, in view of variations in power, considering different positions of the needle in the nozzle of the carburetor. The several needle valve adjustments are referred to in degrees. To be explicit, the needle was turned 360, 540, or to other positions as stated in degrees, and a curve of performance is given for each of the needle positions. The best performance noted in Fig. 11 is for the opening given as 350 degrees. The thermal efficiency resulting from the test was maximum at 30 horsepower of the motor. With the 360 degree position of the needle the performance was that which would indicate a condition of easy stalling of a motor in the hands of the average autoist; the motor with this adjustment would deliver a little

more power at the lower range due to an enriched mixture, but the thermal efficiency falls away rapidly with increasing power and drops to substantially two-thirds of its best value, between 25 and 30 horsepower.

It has been shown that the power changes with the thermal efficiency and that the thermal efficiency as shown in Fig. 11, with the 360-degree needle valve adjustment would be, in all probability, attended by a change in power. Referring to Fig. 12, a means is at once afforded for checking the relations of thermal efficiency to power for different adjustments of the needle valve.

The information thus far afforded in connection with Pierce work is sufficient to indicate, in part, the extent to which matters of this sort are pursued in the well-equipped establishments devoted to the manufacture of automobiles.

TIRE PROBLEMS INTELLIGENTLY COPED WITH

Experimental investigations in wide extent have been carried on in several establishments. In view of this, it is a little difficult to sort out a few of them which can be included in a limited talk on the subject. Consequently it will be the idea here to "touch and go," as it were, for the purpose of presenting a widely diversified situation. Fig. 13, for illustration, presents a tire-testing machine, devised by F. J. Newman, Chief Engineer of the Woods Electric Vehicle Company, Chicago, used by the

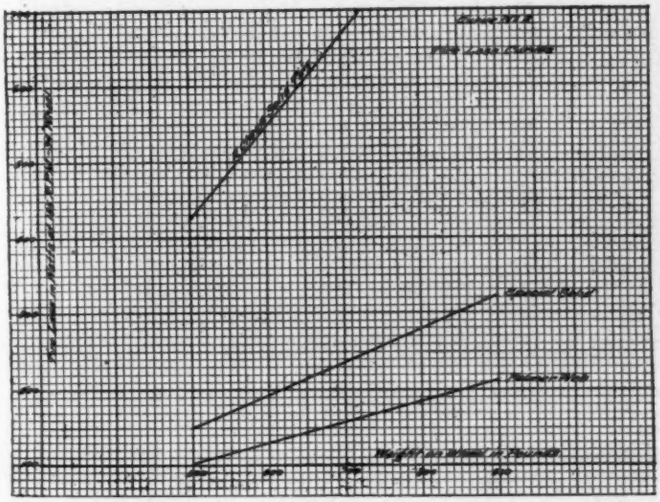


Fig. 15—Curve showing the tire loss in watts under differing load conditions

company for the purpose of determining tire losses and life. In this machine the tire to be tested *T1* is mounted upon its wheel *W1* and presses against a wooden wheel *W2*. The wheel *T1* is mounted on a shaft and a pulley, *P1*, being mounted on the same shaft, is driven by a belt *B1* which takes its power from the pulley *P2*, the same having connection with an electric motor which is the source of power. On the same shaft with the wheel *W2* a brake drum *B2* is placed and brake shoes *B3* and *B4* are arranged to fit over and be clamped against the drum *B2*, so that the Arm *A1* measures the force of the twisting moment which will be exerted through the brake drum *B2*, which force is interpreted in pounds on the platform of the scales *S1*.

Since the wheel *W1*, on which the tire *T1* is placed, is provided with an adjustment in order to vary the distance between the tire and the drum *W2*, it is possible to increase or decrease at will the force which will be exerted between the tire *T1* and the drum *W2*. Since the tire *T1* is driven by the belt *B1*, over the pulley *P1*, the drum *W2* must be rotated by traction against the tire *T1*. The amount of the traction will therefore be registered on the scales *S1*, through the brake arm *A1* and varied by altering the clamping of the brake shoes *B3* and *B4* against

By painting the surface of the wheel *W2* and pressing the tire

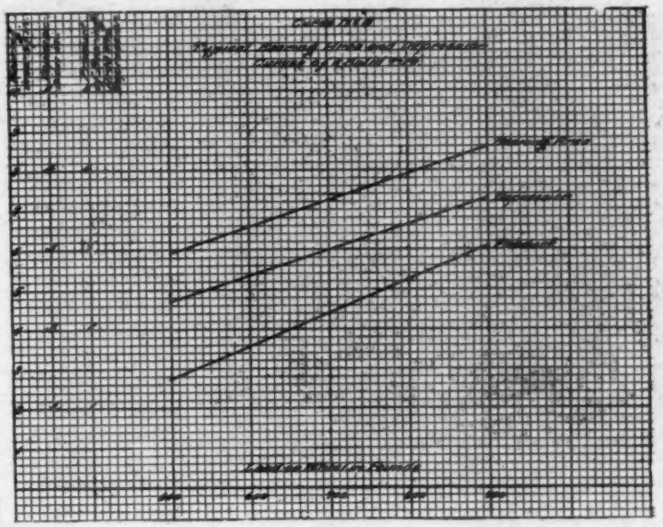


Fig. 16—Curve interpreting data as procured in connection with tests made on tires at the Woods plant

T1 against the painted periphery of the wheel, it is possible to measure the area of contact of the tire being tested, since a piece of paper slipped in between will receive paint over the surfaces of contact and make a permanent record—which record will be characteristic of any particular tire under a given condition of inflation and for a given pressure. Since it is not the purpose at this time to reach conclusions in relation to tests of this character, it will be sufficient for the present purpose to reproduce tire contact records as shown in Fig. 14, *A*, *B*, *C*, *D* and *E*, they representing tires as follows:

(*A*) Represents an endless solid tire showing 6.8 square inches area of contact.

(*B*) Represents an endless solid tire, showing 7.1 square inches area of contact.

(*C*) Represents an endless solid tire, showing 8 square inches area of contact.

(*D*) Represents an endless solid tire, showing 8.5 square inches area of contact.

(*E*) Represents an endless solid tire, showing 5.65 square inches area of contact.

It will be seen that the performance, when reference is had to tires from the point of view of life and energy consumed, will not be the same when all of the tires do not flatten the same amount under a given load and other equal conditions of the tire on the periphery of the brake drum *B2*.

Fig. 17—A showing of instruments of precision required in the manufacture of high-grade automobiles

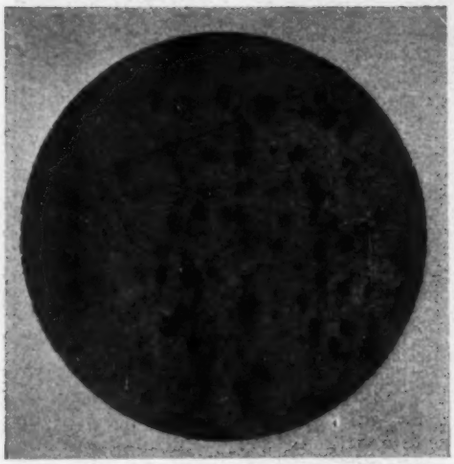


Fig. 18—Micro-photogram of malleable iron showing views at high magnification.

Testing machine offers a wide opportunity in the process of investigation. Considering the possible variations in materials and under different physical conditions, it affords a means for determining the tractive coefficient for the respective shapes.

Fig. 15 is a curve plotted to show the losses in watts under different loads considering differences in tires. There is a marvelous variation in the losses between the several tires. For illustration: The Palmer web tire on a 34-inch wheel under a load of 900 pounds shows a loss of 212 watts at 185 revolutions per minute; a cheap tire under a load of only 700 pounds shows a loss of 666 watts going at the same speed and considering the same diameter of tire; a special solid tire which was established as to its composition, after experimenting under a load of 700 pounds, on a 38-inch wheel showed a loss of only 238 watts, the speed being 185 revolutions per minute.

Referring to Fig. 16, an opportunity is afforded to observe the performance of solid tires as used in electrics, made under a wide range of loading in pounds on the wheel-bearing area, in square inches, depression in inches, and the product as given in terms of "product of bearing area and depression." This product has a certain value, in that it shows a diagonal line which is not parallel to the line of depression or that of the bearing area, but note that the lines representing bearing area and depression under changing loads are very nearly parallel. A long story is probably hidden away in the data obtainable on testing tires in this way. Some of it may be given in the future, when time and space are more favorable. For the present it will be enough to reflect the radius of possibilities by quoting from Mr. Newman:

"The process of testing a tire consists in delivering to the wheel which is equipped with the tire a certain amount of power at a given speed and measuring the amount of this power which the wheel and its tire delivers to the revolving drum.

"The difference between the power delivered to the tire and the power which the tire delivers to the drum is the power which is used up in internal or molecular friction within the tire. By varying such conditions as pressure on the tire, speed, torque transmitted, data can be obtained from which curves can be plotted showing the relation of internal tire friction to various external conditions.

"In the actual process of testing a tire, the wheel upon which it is mounted is withdrawn from contact with the drum and a Prony brake is mounted upon the shaft which supports the wheel and its tire. By means of this Prony brake the electric motor can be made to deliver the determined amount of power to the wheel shaft at the proper speed, and the input to the motor is then measured in amperes and volts by means of instruments inserted in the motor circuit."

INSTRUMENTS OF PRECISION FOR EXPLORATIONS

In a well-equipped laboratory, such as that of the Woods, the wide range of work which has to be done demands the use of

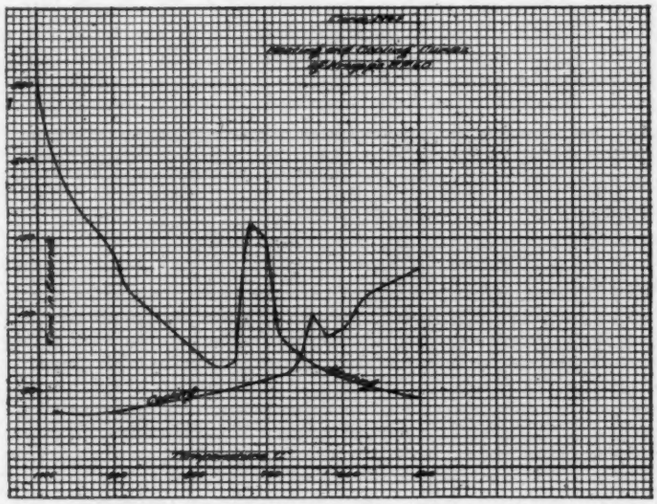


Fig. 19—Showing temperature performance of steel when it is being heated and when it cools off

a considerable equipment. Fig. 17 will give a fair idea of this:

(*A*) A metallurgical microscope with a camera.

(*B*) A "Shore Sclerescope" with which harness test are made.

(*C*) A mille-voltmeter connected to a pyrometer couple in electric furnace.

(*D*) A "Turner-Landgraf" alternate impact machine.

(*E*) A group of electrical measuring instruments.

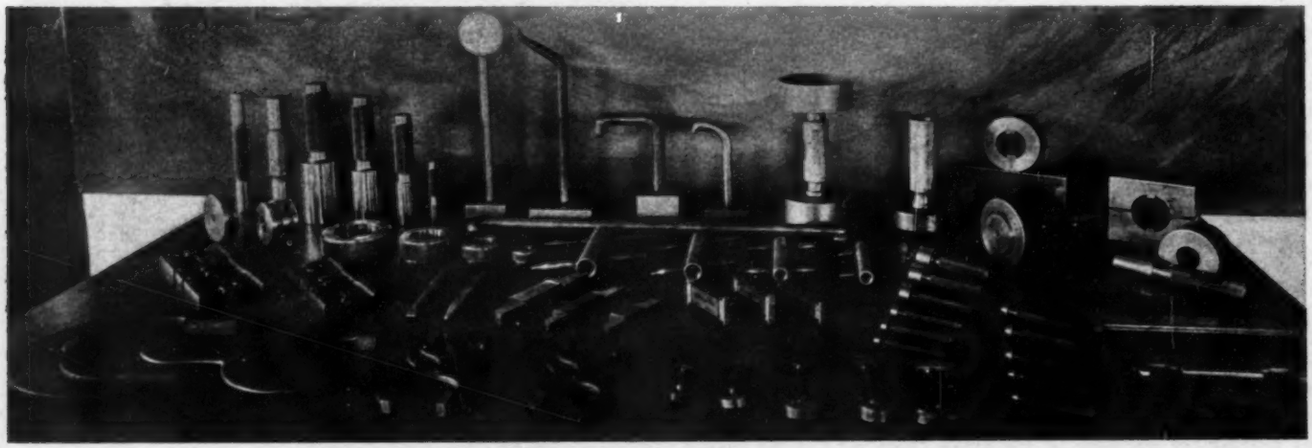


Fig. 20—A scattering of measuring instruments of the fixed order, as plug and ring gauges used by workmen in the shop

The metallurgical microscope permits the investigator to view specimens at from 100 to 1,200 diameters, thus bringing out the structural peculiarities. In steel in particular, it is possible to note if the metal is in the one or the other of the carbon states and the degrees of crystallization. When it is desired to make a record of a view through a microscope, the camera is brought into play. Fig. 18 is just such a view which was taken in connection with Mr. Newman's investigations in this case of malleable iron. the data governing the photo-microgram being as follows:

(*A*) Center of malleable casting, fully malleable.
(*B*) 2-3-inch projection.
(*C*) 1-inch eye piece.
(*D*) Etched 20 sec. 5 per cent nitric acid solution of alcohol.
(*E*) Seed process plates.

The time was when fabricators of steel had a monopoly of information in relation to the lack of qualities of their wares. This time has drifted into history. It did not take ten years of automobile building to bring out the fact that a kinetic machine such as an automobile demands qualities which do not reside in cast iron, yellow brass and Bessemer bars. Automobile engineers when they realized the condition which undoubtedly did exist on

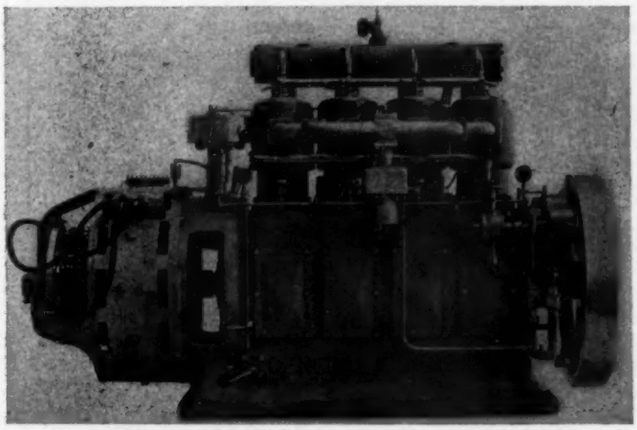


Fig. 21—Dynamo electric machine directly connected to a gasoline motor as used in charging batteries and other work

the marks of steel, then took time by the forelock, equipped their plants to make tests for themselves, and dictated quality where once it seemed to exist as a vague dream and nothing more.

Fig. 19 is a curve which was plotted in the Woods laboratory, showing the temperatures of heating and cooling of Krupp chrome nickel steel, of the brand known as E. F. 600, as used in certain parts of great responsibility, as spindles, etc., in connection with Woods electrics. The chemical composition of this steel may be stated substantially as follows, with the understanding that there will be slight variations as between the respective heats:

Chromium	1.40
Nickel	4.40
Carbon	0.25
Silicon	0.20
Sulphur	0.013
Phosphorus	0.012
Manganese	0.36
Copper	0.006
Arsenic	0.007
Physical shape	bars.

The curve is interesting in that it shows the temperature at which a lag occurs, both in heating and cooling. This information, in itself, serves no useful purpose, but to the

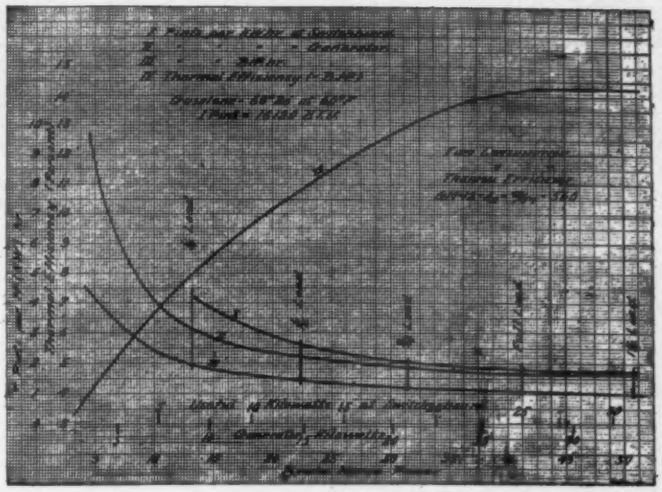


Fig. 22—Characteristic of dynamo performance, presenting evidences of great value of graphic methods

skilled manipulator it tells a story most necessary to know, if heat treatment work is to be done intelligently and if the results are to be on a predetermined basis. In the well-equipped plant, then, as compared with haphazard establishments, things go by direction, and enforced co-operation is the order of the day.

FIXED GAUGES ADVANTAGEOUS IN THE SHOP

The system of go-gauges as manufactured by Brown & Sharp and other makers of instruments of precision are probably quite well understood in a general way, and yet it remained for establishments like the Cadillac Motor Car Company, Detroit, to bring the system to the highest state of perfection, producing exact work, invariably without excessive augmenting cost.

By way of illustration, in the Cadillac plant this system of go-gauges is utilized in a secondary way—that is to say, a system of master plug and ring gauges are kept in the tool room, they being precise as to dimensions and sufficient in range to cover every measurement required to be made in connection with the building of Cadillac automobiles. In the shop, each workman is provided with plug and ring gauges which are precisely sized to measure the very operations the workman is required to perform, and all that he has to know is that the gauge will or will not go. A plug gauge in this system takes advantage of the

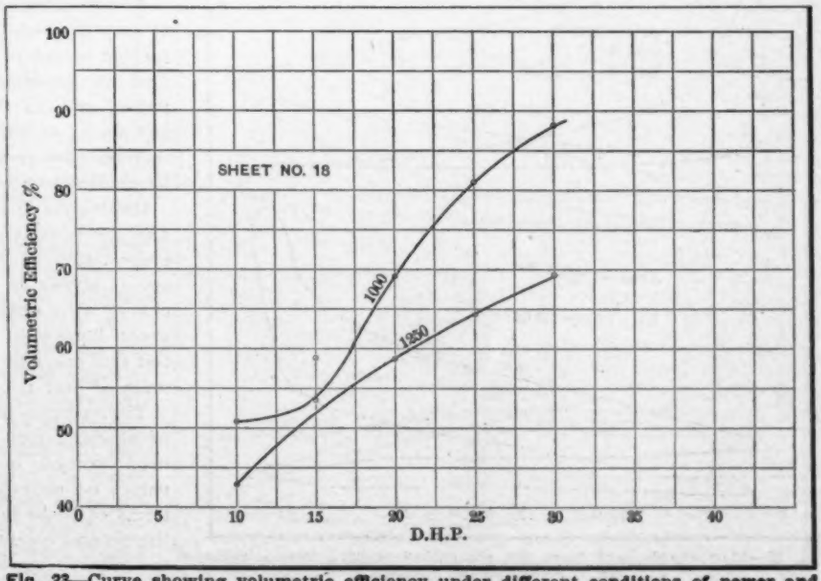


Fig. 23—Curve showing volumetric efficiency under different conditions of power and speed of a Pierce motor

allowable limits of variation in that one end of the gauge is just a little too big for the right-sized hole, so that it will not go, and the other end of the gauge is as much smaller as the limit of tolerance fixed for the work indicated. If the work is ground to the right size the gauge will go. If the work is a shaft or other part to be measured over its diameter, ring go-gauges supplant plug go-gauges. The accuracy thus arrived at in the hands of men of sufficient caliber is made possible by the go-gauges, and the gauges of course are as accurate as the company cares to have them. Interchangeability does not demand a neat fit of parts, but it does indicate narrow limits of tolerance. Fig. 20 represents an assortment of gauges of this character, they being but a few of the many in common use.

Disjointed facts in the abstract rarely ever afford insight into the workings of an intricate situation sufficient to satisfy the ends to be met. When all the facts which are known are presented in graphic form they take on the characteristics of a bird's-eye view and the unknown quantities may then be estimated within reasonable limits of certainty.

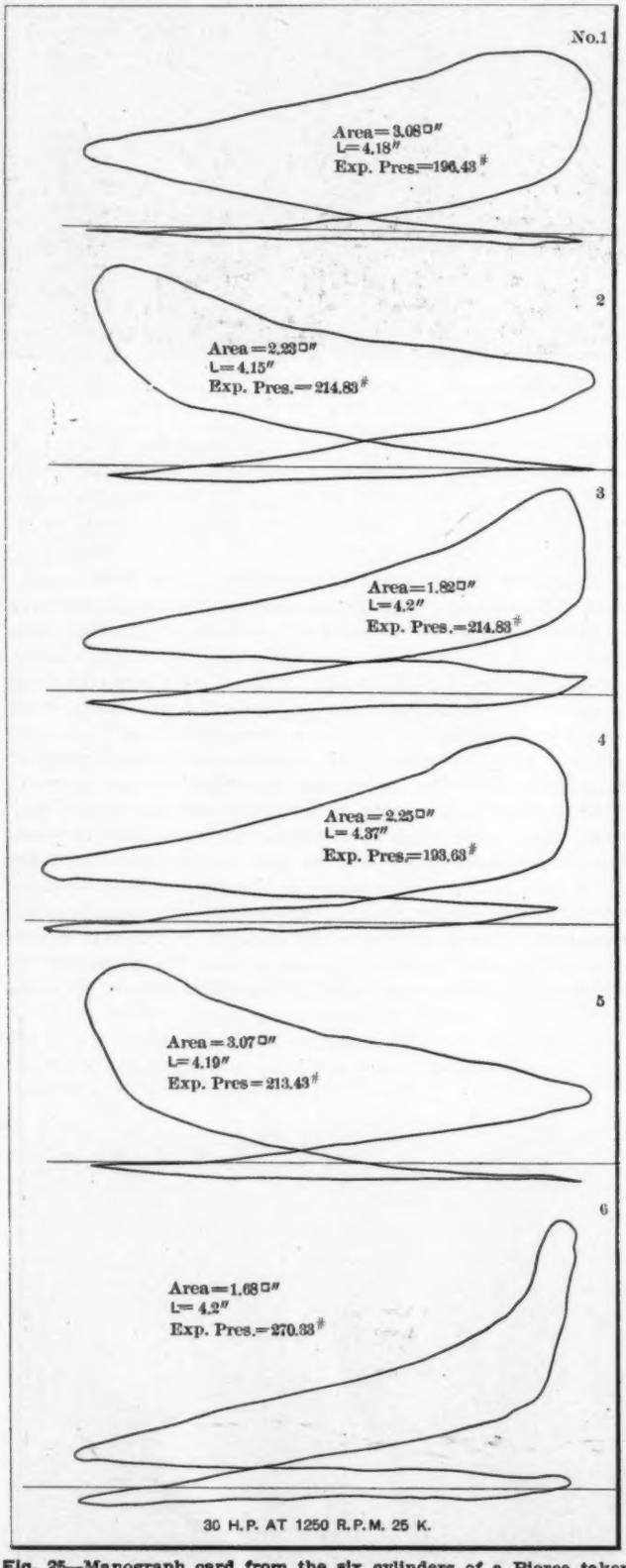


Fig. 25—Manograph card from the six cylinders of a Pierce taken at 1,250 revolutions per minute.

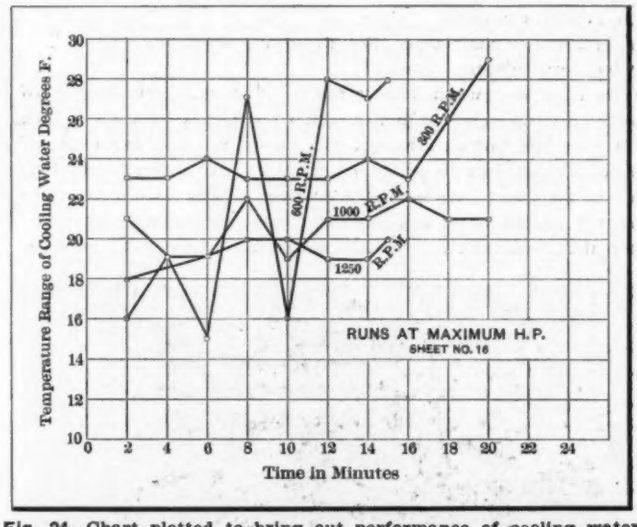


Fig. 24—Chart plotted to bring out performance of cooling water under different conditions of power and speed

In order to better understand the value of a graphic presentation Fig. 21 is offered. This represents a dynamo electric machine, directly connected to a gasoline motor as manufactured by the General Electric Company at the Schenectady plant. It is of the same type used for lighting, the charging of storage batteries and kindred work.

The dynamo has an output of 25 kilowatts, as normally rated. It may be overloaded to the point known as 1 1-4 load for a specific period of time. When the dynamo is delivering its full load the gasoline motor must deliver nearly 42 actual horsepower, and, as the illustration indicates, the motor has all the ear marks of automobile motors, with the exception, of course, that the base is shaped to stand on a foundation rather than to be cradled in a chassis frame as in automobile work.

Illustrating the utility of the graphic method of arriving at and recording engineering data, Fig. 22 is afforded, it being a presentation of the characteristics of the 25-kilowatt generator set as shown in Fig. 21. In making the test the engineer in charge used gasoline, the specific gravity of which was 68 degrees Baumé, at 60 degrees Fahrenheit, and it was found by test that one pint of the gasoline contained 16,120 British thermal units of heat (B. T. U.).

The columns of figures to the left on the chart fix the valves of abscissa, first in pints per horsepower hour of the gasoline used; second, in terms of thermal efficiency (per cent). The values of ordinates, reading from the bottom up, are first, in terms of brake horsepower required to drive the generator under the several conditions of load; second, the output of the generator in kilowatts, measured at the terminals of the same, and third,

the energy actually delivered at the switchboard as measured in kilowatts.

With this chart available, it is possible to see at a glance the relative performance of the generator under varying conditions. For illustration, referring to curve IV and at 3-4 load, the thermal efficiency is 13 per cent (slightly under) which is found by following up the ordinate representing 3-4 load to the point of intersection of the curve IV with the abscissa which has the value of 12.9 (very nearly 13 per cent). This curve shows that the thermal efficiency increases as the load becoming a maximum at a point just beyond full load, and holding stationary thereafter. The thermal efficiency is of course very low for everything under 1-4 load, it being about 7.8 per cent at that point. This value 7.8 for the thermal efficiency at 1-4 load is relatively very good, it being about the maximum thermal efficiency for the average high-speed slide-valve steam engine. Granting this, it follows that the thermal efficiency in internal combustion motors at anything above 1-4 load increase very rapidly above the average thermal efficiency under conditions of average steam practice.

There is one other point of importance which is clearly shown in this graphic presentation. It relates to the gasoline consumption under the varying conditions of load. Considering the power of the gasoline motor in brake horsepower, and utilizing curve III, it will be observed that 1.1 pints of gasoline will serve for one horsepower hour when the motor is running at full load of the generator. This gasoline consumption increases by gradual increments up to 1.9 pints of gasoline per horsepower hour, when the power delivered is that required at 1-4 load of the generator. The thermal efficiency falls away with decreasing load because the gasoline thus increases. This chart, while it is primarily related to this generator set, reflects conditions which will be found in gasoline motors in general, and, to a certain extent, as they are used in automobile practice, with the exception, however, that the better conditions, which obtain in automobile work, will reflect a little more favorably and the thermal efficiency will be on a little higher plane.

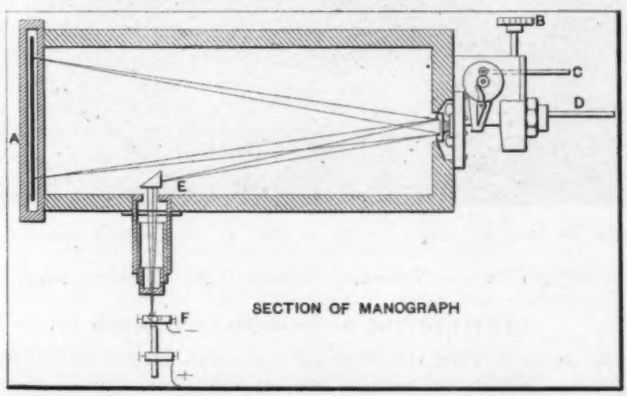


Fig. 27—Section of the manograph used in the testing of the Pierce motor under direction of Prof. Rola C. Carpenter

Unfortunately, the volumetric efficiency is not constant under all conditions of load and speed, when reference is had to internal combustion motors. In automobile work in particular, both the load and the speed vary over the broadest ranges. This volumetric efficiency is graphically represented in Fig. 23, which was taken from the Pierce series of tests, and it presents the situation very aptly. The volumetric efficiency decreases with increasing speed, due to the decreased time which is afforded for the incoming mixture, and by volumetric efficiency measurements it is possible to ascertain when the suction pressure crosses the atmospheric line. Under different conditions of power when the motor is running at 1,000 and 1,250 revolutions per minute respectively, the efficiency reaches its maximum of about 88 per cent in this particular motor at 30 horsepower for the speed given.

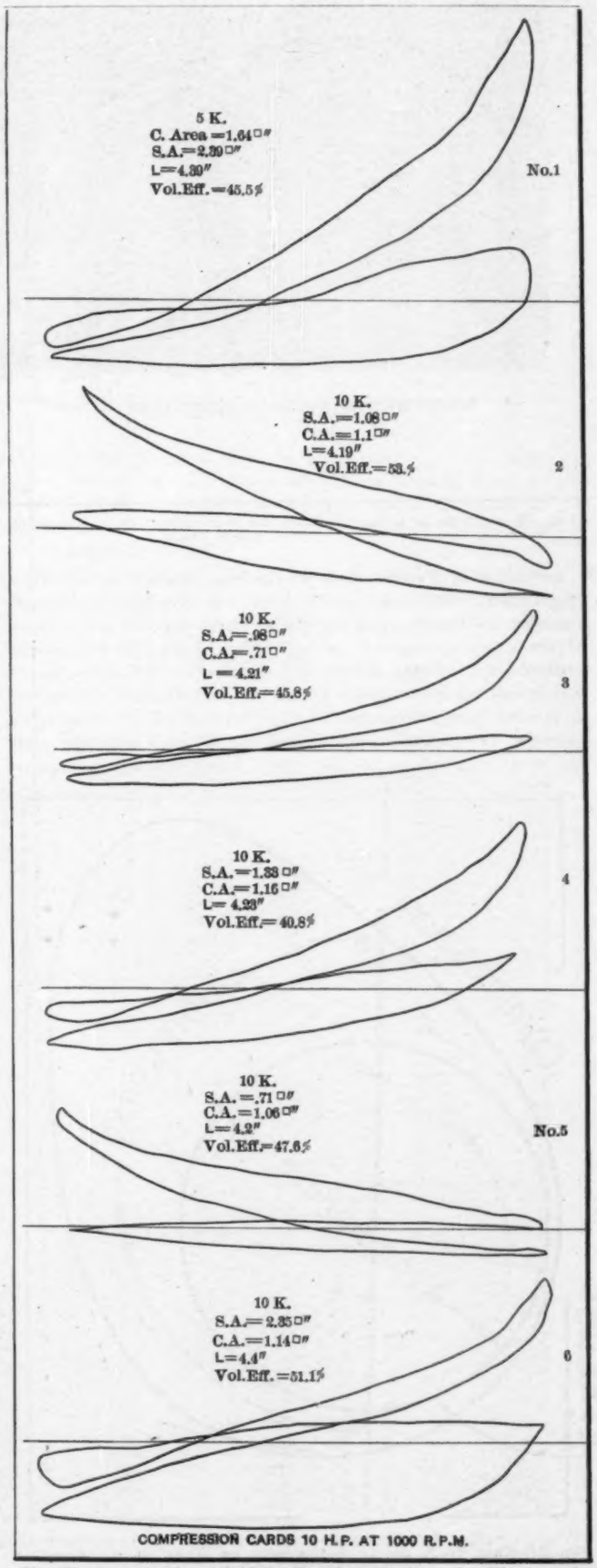


Fig. 26—Monograph cards from the six cylinders of a Pierce motor running at 1,000 revolutions per minute

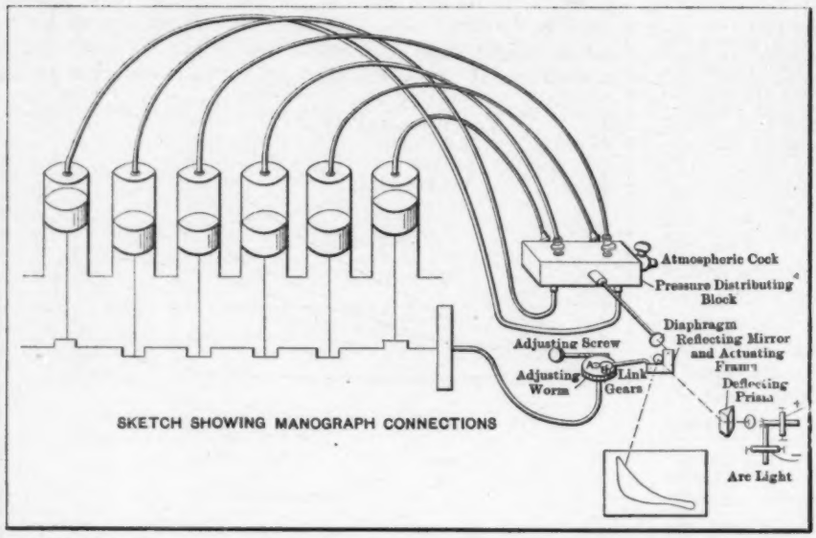


Fig. 28—Scheme of connecting up the manograph as it was used in the conduct of these tests

Influence of Temperature of Cooling Water—As a further illustration of the advantages to be derived from graphic methods reference is here made to Fig. 24, in which abscissa are in terms of temperature range of cooling water in degrees Fahrenheit; ordinates are in terms of time and minutes, and the motor, which was a "six," was run under conditions of maximum horsepower at several speeds from 600 to 1,250 revolutions per minute, inclusive. The temperature changed rapidly and violently when the motor was run at the low speed, which was 600 revolutions per minute. This goes to show that motors are prone to heat up, perhaps excessively, when the load is maximum for the minimum speed. The same characteristic is noted at a speed of 800 revolutions per minute, excepting that the changes are not so sudden. Nevertheless the temperature of cooling water increased persistently after a run of 16 minutes, whereas at 1,000 revolutions per minute the temperature ceased to increase after 18 minutes.

Autoists before acquiring a fair measure of experience frequently have what is termed "cooling trouble." It rather looks to the author as if it is in the nature of "heating trouble." This trouble comes primarily for reasons which are reflected in the chart Fig. 24, but they are accentuated if the motor is run on a retarded spark. Under the circumstances, in view of the information afforded, it would seem to be a good practice to avoid retarding the spark in the process of operating the motor at the low speed. Altering the richness of the mixture and the quantity thereof (putting it up to the carburetor) would favorably influence this heating trouble.

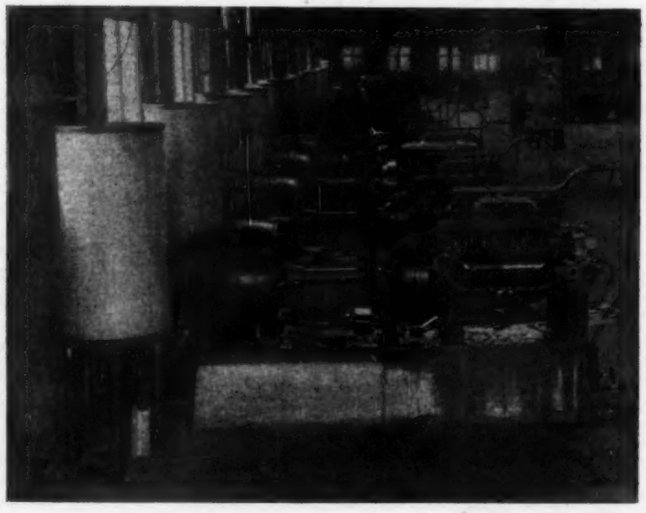


Fig. 30—Row of testing blocks as used at the Rambler plant for testing motors

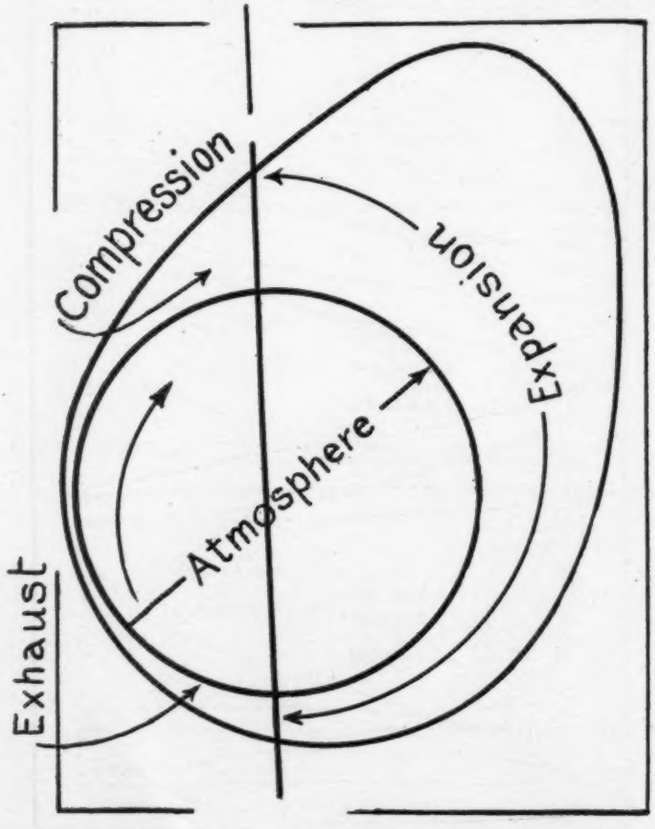


Fig. 29—Card from Purdy manograph, as taken at the Rambler plant by the inventor

UTILITY OF THE MANOGRAPH CONSIDERED

On account of the very high speed at which automobile motors operate, inertia, lost motion and other imperfections of indicators in general, renders them wholly unfit for use in determining the gas performance in the cylinders. The manograph, as an instrument, was contrived with the idea of overcoming these troubles, and it possesses certain virtues, among which is practically no inertia—this because of the utilization of photographic principles, on the theory that a beam of light is substantially free from inertia.

The cards taken by means of the manograph, as it is ordinarily used, look very much like the cards which are taken with a steam indicator. Fig. 25 shows the set of cards which were taken for the Pierce Company, one from each of the six cylinders of a Pierce motor, when the same was delivering 30 horsepower at 1,250 revolutions per minute. The information given on the cards is sufficient to make further discussion unnecessary at this time, save that it will be of advantage to have a set of compression cards from the same motor. This set is

given in Fig. 26. They were taken when the motor was operating at 1,000 revolutions per minute delivering 30 horsepower.

The manograph used in this case was the Hospitalier-Carpentier, and the work was done under the direction of Prof. Rola C. Carpenter by graduates of Sibley College, Cornell. The section of the manograph shown in Fig. 27 and the method of connecting up is given in Fig. 28 with sufficient descriptive matter appended to satisfy the present situation.

Purdy Polar Manograph Has Advantages—In view of the importance of the subject, mention will be made of the Polar type of manograph now used in the Rambler plant of Thos. B. Jeffrey & Company, Kenosha, as invented by Frederick Purdy, Chief of the Rambler laboratory. This manograph produces a card as shown in Fig. 29, in which the beam of light rotates and presents a perfect circle at the atmospheric pressure, expanding as the pressure increases. In determining the pumping losses from this card all areas to the left of the center line represent losses, while the area of the expansion zone to the right represents useful work. It takes a little studying to make one familiar with this type of card, but it is entirely free from inertia and has other advantages which the author hopes to bring out at an early date.

A. L. A. M. LABORATORY WORK

In order to bring about a standardized set of conditions, the Association of Licensed Automobile Builders maintained what was designated as the Mechanical Branch, which was under the direction of a committee made up of chief engineers from some of the companies, and, having established a laboratory at a convenient point, investigated materials and conditions involved at length for the common good. It will be impossible to review the workings of the Mechanical Branch further than to briefly summarize a part of the result, sufficiently perhaps, to indicate the high character of the undertaking, and to enable purchasers of automobiles to appreciate at least a part of the reason why so much progress has been made in so short a time.

Specifications for Gas Engine Lubricants—In view of the importance of good lubrication, especially in cylinders of motors, investigations were made and the report rendered was as follows:

"Oil for this purpose must be a pure mineral oil, no addition or adulterant of any kind being permitted.

The following characteristics are desired:

Flash point (as determined in open cup) should not be less than 400 degrees Fahrenheit, and the fire test should not be less than 450 degrees Fahrenheit. Viscosity as measured at 100 degrees Fahrenheit, using a Saybolt Viscosimeter, should read not over 300 seconds. At other temperatures the viscosity should be as follows:

At 210 degrees Fahrenheit (Saybolt) 40 to 50 seconds.

At 210 degrees Fahrenheit (Tagliabau) 60 to 75 seconds.

Specific gravity should indicate between 30 and 32 degrees Baumé.

Residue on evaporation not over 1 per cent.

According to the recommendation the flash point should be the lowest degree at which the vapor ignites and goes out.

The fire test should be the lowest degree of which the vapor ignites and continues to burn.

The specific gravity may be determined by special hydrometers, or better, by means of a Westphal balance.

Residuum on Evaporation—This test is of a special nature; in a retort (No. 16,384 Bausch & Lomb, or No. 3,873 Eimer & Amend) is placed between 40 and 50 grammes of oil carefully weighed. This retort is then put over the naked flame of a Bunsen burner and heated slowly to the boiling point, continuing the heat until all the liquid portion of the oil has passed over and out of the retort. The heating is then further continued by passing the flame over the entire surface of the retort in such a manner as to drive off everything possible from the body and neck of the retort which can be driven off at an incipient red heat. This is a temperature at which the glass in the retort begins to soften.

Fig. 31—Testing dynamometer at the Rambler plant contrived to test completed automobiles

A coke-like residuum will be found in the retort. When the retort is cooled, this residuum should be weighed and the percentage of residuum, as compared with the original weight of the oil, may then be determined.

Only the best makes of retort will answer for this test, and for reliable work it should be made of Jena glass. Even with this quality of retort breakages are frequent, and, as a matter of fact, the test must be conducted with the greatest care.

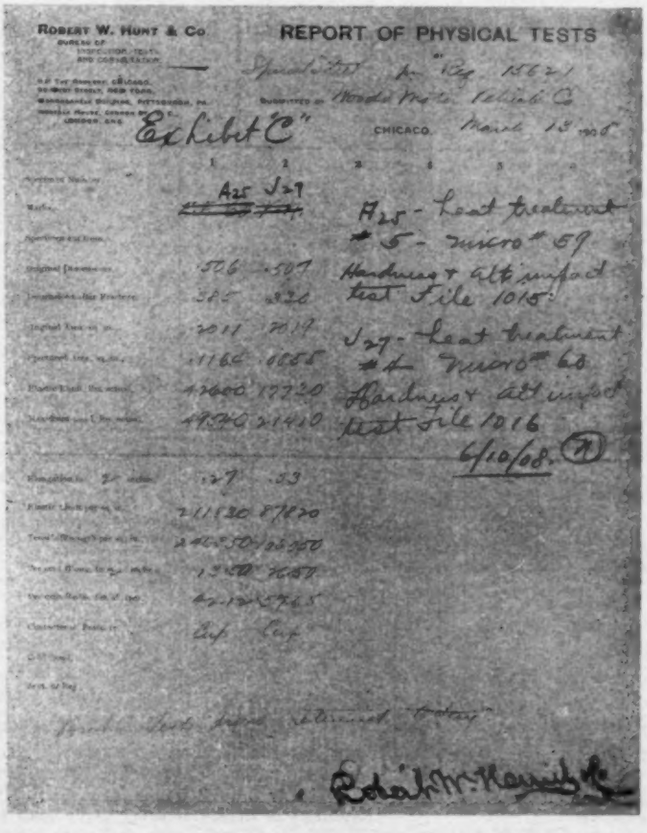


Fig. 32—Method of reporting investigations of steel as made by the Hunt laboratory

The Mechanical Branch of the A. L. A. M. fully settled a great many of the lubricating controversies for the manufacturers of automobiles, and eliminated speculation in so far as they are concerned. In the same way, the Mechanical Branch took up with the questions of steel, brass, bronze, and babbitt metals, fixing the limits within which it is safe to operate, considering the materials available or to be had by special heat.

A.L.A.M. SPECIFICATIONS NO. 3 FOR NICKEL STEEL

Nickel, 3.00.
Carbon, 0.20-0.28.
Silicon.
Sulphur, 0.04.
Phosphorus, 0.04.
Manganese, 0.60-0.90.

PHYSICAL PROPERTIES REQUIRED

Tensile strength, 85,000 pounds per square inch.
Elastic limit, 55,000 pounds per square inch.
Elongation, 25 per cent. in 2 inches.
Reduction of area, 50 per cent.
Condition, annealed.

PHYSICAL PROPERTIES AFTER HEAT TREATING

Tensile strength, 100,000 pounds per square inch.
Elastic limit, 70,000 pounds per square inch.
Elongation, 20 per cent. in 2 inches.
Reduction of area, 50 per cent.

TABLE II—CYLINDER ANNEALING TEST AT 400° F.

Measurements Made on Cold Cylinders. Cylinders Hot 15 Min. and Cold 15 Min.

Cylinder	Time	Top Parallel to pin	(Head) Perpend. to pin	Bottom Parallel to pin	(Open end) Perpend. to pin
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	10:45	3.6241	3.6240	3.6245	3.6248
	11:00				
	1:00	3.6241	3.6241	3.6246	3.6248
	1:15				
	4:15	3.6241	3.6240	3.6246	3.6248
Hot	5:00	3.6350	3.6340	3.6350	3.6350
2	9:45	3.6243	3.6241	3.6249	3.6244
	10:45	3.6243	3.6240	3.6249	3.6244
	11:00				
	1:00	3.6247	3.6240	3.6249	3.6245
	1:15				
	4:15	3.6247	3.6240	3.6249	3.6244
Hot	5:00	3.6360	3.6350	3.6350	3.6350
3	9:45	3.6242	3.6246	3.6249	3.6250
	10:45	3.6243	3.6245	3.6249	3.6248
	11:00				
	1:00	3.6241	3.6244	3.6249	3.6249
	1:15				
	4:15	3.6243	3.6244	3.6248	3.6249
Hot	5:00	3.6350	3.6350	3.6360	3.6360

Oct. 16, 1908. L. R. Evans.

TABLE I—COMPARATIVE RADIATOR DIMENSIONS

Name	H.P. A.L.A.M. Rating	Area of front surface of Radiator in sq. ft.
Thomas (K)	72⅜	4.14
" (F)	53	3.33
" (L)	31⅝	3.28
" (G)	18¼	2.15
" (M)	43⅛	3.66
" (E)	53	3.74
Packard	40	3.0
"	26	2.56
Matheson	40	3.10
Pierce-Arrow	36	2.85
Rainier	(4 cyl.)	3.45
National	35	3.48
"	50	4.94
Haynes	36	2.65
Royal	42	3.0
Peerless	38	3.11

Sept. 1, 1909.

Note: The front areas, as given, do not tell the whole story. In order to be able to ascertain why the respective motors perform satisfactorily even though the front areas are not the same, it is necessary to investigate the motors, and determine the flame-swept surfaces, efficiencies, and depth of radiators, as well as other matters. This table tells of one phase of the effort to evolve quality, the other phases having been taken up in regular order.

TABLE III—TEST DATA OF REED EJECTOR MUFFLER

Speed of car Miles per hour	Manometer reading—Mercury Inches—Muffler In	Out	Back pressure. No. sq. in. above atmosphere—Muffler In	Out	Position of throttle	Remarks
55		1.8		.88	Full	Level
60	10.4		5.1		"	"
70	8.6		4.21		"	Down hill
40		.7		.343	⅞	Up hill
50	6.8		3.33		⅞	"
60	7.6		3.72		⅞	Level
60		2.0		.98	⅞	"
70	8.4		4.11		⅞	Down hill
45	7.6		3.73		¾	Up hill
50	8.5		4.16		¾	"
60	10.0		4.9		¾	Level
60	9.8		4.8		¾	"
63	10.0		4.9		¾	"
73	8.4				¾	Down hill
74		2.6		1.27	¾	"
40	4.6		2.26		⅝	Level
45	5.0		2.45		⅝	"
45		1.0		.49	⅝	"
50	6.0		2.94		⅝	"
55		1.7		.835	⅝	"
60	7.0		3.43		⅝	"
65	7.4		3.62		⅝	"
65		2.0		.98	⅝	"

TABLE IV—PISTON DISTORTION TEST

1st bridge Paral-Perpen to pin		2d bridge Paral-Perpen to pin		3d bridge Paral-Perpen to pin		4th bridge Paral-Perpen to pin		Between wrist pin and 4th Paral-Perpen to pin		Bottom Top Paral-Perpen to pin		Web Paral-Perpen to pin	
Readings with no load ever applied to piston. Piston straight ground.													
3.6170	3.6170	3.6224	3.6220	3.6223	3.6220	3.6225	3.6220	3.6225	3.6220	3.6220	3.6220	3.6220	3.6220
Readings of diameter with 2-ton load. Practically maximum pressure occurring during operation of engine.													
		3.6234	3.6216	3.6263	3.6204	3.6262	3.6192	3.6269	3.6202	3.6210	3.6190	3.6224	3.6175
		3.6232	3.6212	3.6260	3.6200	3.6265	3.6200	3.6265	3.6200	3.6217	3.6185	3.6223	3.6170
Readings of diameter with 5 ton load.													
		3.6245	3.6205	3.6275	3.6185	3.6315	3.6160	3.6310	3.6185	3.6175	3.6155	3.6210	3.6140
		3.6245	3.6210	3.6280	3.6190	3.6320	3.6165	3.6315	6.3190	3.6180	3.6160	3.6205	3.6140
Pressure of 7 tons applied and rod failed. Readings of diameter after 7-ton load pressure removed. Permanent set of pistons.													
3.6170	3.6170	3.6224	3.6220	3.6227	3.6215	3.6238	3.6216	3.6245	3.6224	3.6203	3.6230	3.6203	3.6243
3.6170	3.6170	3.6222	3.6220	3.6225	3.6213	3.6236	3.6214	3.6244	3.6223	3.6203	3.6230	3.6299	3.6243

· ELECTRICS · EXTENDING · SCOPE · OF · USEFULNESS ·

· By · Thos · J · Fay ·

HISTORY as it relates to electric vehicles presents a long series of efforts undertaken in the process of bringing the storage battery up to its present state of efficiency. The electrical equipment in general was substantially protected, even before the electric vehicle became a serious undertaking, but the battery situation retarded progress for a number of years, not so much due to inherent lack of ability of the storage battery as

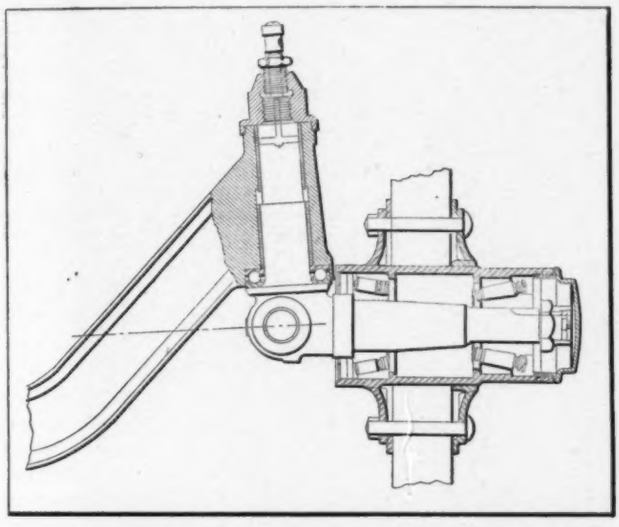

Fig. 1—Lemoine type of steering knuckle with Timken roller bearings and a ball thrust

a type, but to lack of training of the men who were required to handle an electrochemical equipment, they not being possessors of sufficient knowledge of this highly technical character.

ELECTRIC VEHICLES MECHANICALLY CONSIDERED

In a general way, the running gear of an electric vehicle differs but slightly from the same class of gear, as it obtains in gasoline automobile tactics. The wheelbase is generally shorter in the electric vehicle, the center of gravity is probably a little lower, and the chassis frame is frequently dispensed with, the body serving adequately for the intended purpose. This being of wood has the virtue of resisting the fumes of acid. The acid fumes come, of course, from the battery during the charging period, owing to the presence of sulphuric acid in the electrolyte, the specific gravity of which is about 25 degrees Baumé.

Barring the structural features in electric vehicles, which are brought about to considerations as above, the whole mechanical situation is one which can be treated in a rational way, and in the cars which will be on exhibition they present normal features, differing in a schematic way, so that they may be subdivided in classes as follows:

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(B) Worm drive, of which the Babcock is a fine example.

(C) Shaft drive as presented in the Baker.

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Next to the electrical features which influence the mechanical structure in these vehicles, it is very likely that for the rest, modern drop forgings, steel pressings and anti-friction bearings, are representative of the very best practice. The front axles are pretty generally of the eye section, made in one piece, and while Lemoine, Elliott and the other standard types of knuckles are used, they more often than not have a ball thrust bearing to carry the load. The wheels roll on annular types of bearings in some cases, Timken roller bearings in others, and cup and cone bearings to some extent.

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SPRING SUSPENSION AND RIDING QUALITIES

In view of the weight of battery which has to be carried, frequently reaching at least 2000 pounds, referring of course to the most pretentious types of electric vehicles, the spring suspension must be most carefully thought out, and the character to be determined of material and workmanship incorporated in the springs taxes the ingenuity of the most expert spring makers. In this type of car platform types of springs are much in vogue, they have the requisite characteristics, and the further effort is by way of utilizing a sufficient mass of suitable material. It is now a well-established principle in spring making that quality of material is not the sole criterion. There must be a certain quantity of material used, the mass of which must relate to the foot pounds of energy represented in the body oscillations. The spring makers who deal with this problem are fully informed as to the facts, and, from results attained, it seems to be a fair conclusion that they have taken advantage of every opportunity.

WIRING CONTROL AND OTHER FEATURES

With a view of insuring a minimum of losses when the draft on the battery is maximum, the sizes of wire used are generally such that the drop in volts will be well within 2 per cent. when the current in amperes is equal to three times the normal draft. The wire used is of the class known as "flexible cable" made from pure lake copper, insulated to a good thickness by acid re-

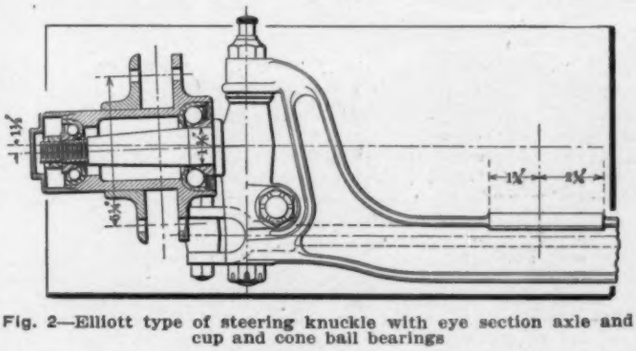

Fig. 2—Elliott type of steering knuckle with eye section axle and cup and cone ball bearings

sisting rubber compound. Cotton braided insulation is not used in view of the effect of acid upon it. The wires are run in wooden casings, or on porcelain insulators, and the preference is for a perfectly accessible position, in order that trouble, if it should creep in, may be quickly found and eliminated.

Controllers are frequently of the drum type, designed for continuous torque work, and five speeds ahead with one reverse seems to be the general practice. Electric vehicles in pleasure service are provided with interlocking devices so contrived that

·THE·A·L·A·M· SHOW·

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	1:00	3.6241	3.6244	3.6249	3.6249
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50	8.5		4.16		¾	"
60	10.0		4.9		¾	Level
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·Electrics · Extending · Scope · of · Usefulness·

·By·Thos·J·Fay·

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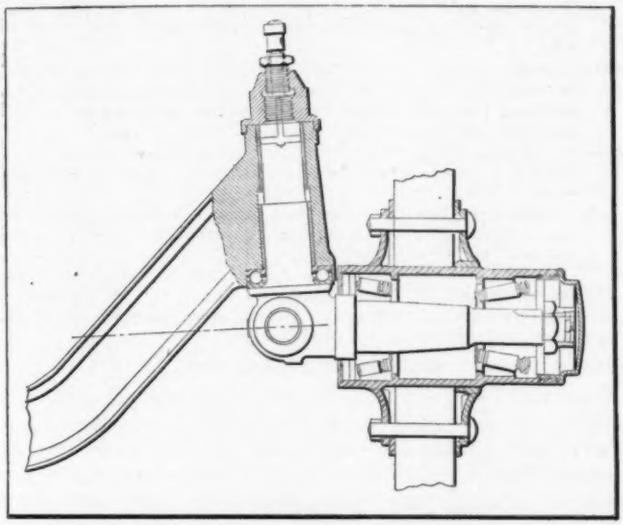

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With a view of insuring a minimum of losses when the draft on the battery is maximum, the sizes of wire used are generally such that the drop in volts will be well within 2 per cent. when the current in amperes is equal to three times the normal draft. The wire used is of the class known as "flexible cable" made from pure lake copper, insulated to a good thickness by acid re-

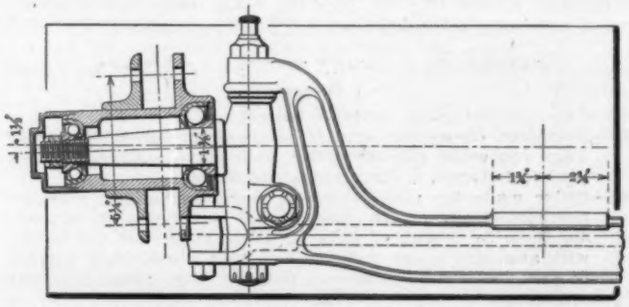

Fig. 2—Elliott type of steering knuckle with eye section axle and cup and cone ball bearings

sisting rubber compound. Cotton braided insulation is not used in view of the effect of acid upon it. The wires are run in wooden casings, or on porcelain insulators, and the preference is for a perfectly accessible position, in order that trouble, if it should creep in, may be quickly found and eliminated.

Controllers are frequently of the drum type, designed for continuous torque work, and five speeds ahead with one reverse seems to be the general practice. Electric vehicles in pleasure service are provided with interlocking devices so contrived that

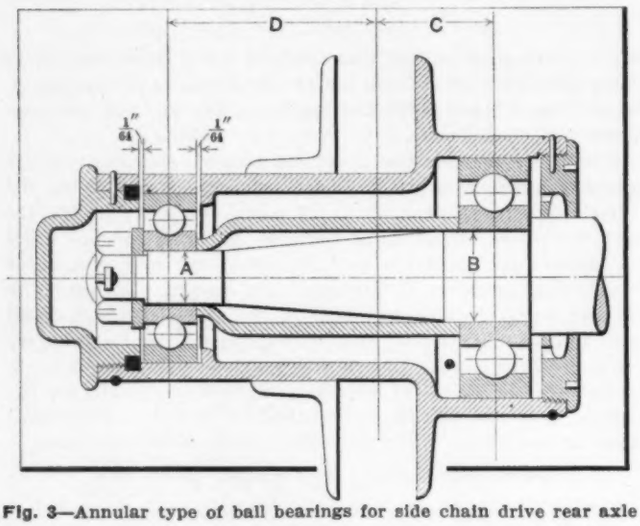

Fig. 3—Annular type of ball bearings for side chain drive rear axle

the operator (if absent minded) is protected as against wrong moves, the idea being to make it impossible to start an electric vehicle excepting gradually, and under precise conditions, which is a matter involving progression, starting the car slowly and gradually working up to the highest attainable speed.

Brakes are mostly mechanical, of great competence and duplicated, thus affording the ordinary service brakes for regularly operating and emergency brakes against an occasion. To some extent electric brakes are utilized also.

STORAGE BATTERIES SIMMERED DOWN

In 1881 M. Camille Faure in France and Charles F. Brush in America, working independently, but along similar lines, patented (Faure in France and Brush in America) methods of hastening formation of active materials on the grids of plates used in lead storage batteries. Since then progress has been slow but sure, knowledge has amplified and makers of storage batteries, against great resistance, due to prejudice born of lack of electrochemical knowledge, have persistently fought. To-day, however, storage batteries are as stable as banks and electric vehicles depend absolutely upon them for success.

The history of the storage battery dates back of the efforts of Brush and Faure, in fact, back to many early investigators, among which the following were the more prominent:

HISTORY OF STORAGE BATTERY EFFORTS

Year. Discovery.

1800—Volta discovered the galvanic battery.

1901—Gautherot discovered that if platinum or silver electrodes were connected together after they were subjected to an electrical charge, a discharge would follow.

1803—Ritter made the same discovery, substituting gold wire for platinum or silver. He superimposed plates of gold, separating them by means of discs of cloth, moistened the couple with ammonia water and observed that a secondary current of good strength and efficiency followed each charge (electric) of the couple.

1837—Schoenbein discovered that peroxide of lead was a medium of great efficiency in storage battery work.

1837—Volta, Davy, Marianini, were successful in adding much to the store of knowledge.

1842—Grove constructed his famous gas battery and he demonstrated that the voltage obtained was due to electrolytic action, liberating oxygen and hydrogen, the electrolyte being acidulated water, using sulphuric acid for the purpose. Grove, by the way, prior to 1842, came forward with the statement that metallic grids, coated with oxide, were better than metallic grids for the purpose, and Wheatstone, as well as Siemens (prior to 1842), found that peroxide of lead was the most efficient for the purpose.

Michael Faraday, about this time, added to the store of knowledge, he having discovered that after electrolyzing a solution of lead acetate, peroxide was produced in the positive plates. Niblett stated that Wheatstone, Niaudet and de la Rue were cognizant of the powerful depolarizing action of peroxide at that time, but it was not taken advantage of then.

1860—M. Gaston Planté constructed his well-known secondary battery, in which sheets of pure rolled lead were separated from each other, by means of felt, and they were then rolled up into a coil, submerged in sulphuric acid electrolyte, and charged; the first practical storage battery was the result. The title to Planté's distinction was somewhat clouded, due to the claim made by M. Duerlir, that Sinsteden took advantage of the secondary action of lead in a bath of sulphuric acid in 1854.

1879—Metzger did away with the long and costly forming process by applying active materials to the metallic grid, thus aborting the necessity of growing active material out of the metallic lead of the grids.

1881—M. Camille Faure, in France, precured letters patent on a process of mechanically applying the active materials to the grids.

Charles F. Brush, in America, took out letters patent on the mechanical process of mechanically applying the active material to the metallic grids.

In an action at law, in the United States, the Court ruled that to Charles F. Brush belonged the honor of the invention.

History, as it is written in France, dissents with the Court which ruled in favor of Brush.

THE THIRTY YEARS' WAR

From 1880 down to the present time represents the period of development, as it were, of the storage battery, and during this time so many patents were taken out by such a large army of inventors that to record them would demand more space than would be available in a Show Number of THE AUTOMOBILE. This period of 30 years represented a war of mind over matter, involving millions of dollars, a myriad of failures and final success.

Strange to relate, the storage battery of to-day, clothed in the ermine of success, is but the storage battery of 1881, carefully made and conforming to the tangle of laws; laws that when offended, as they formerly were, made known their displeasure, and failure was the reward of the offenders.

Distinctions To be Drawn—The Planté type of battery, which was the product of 1860, is one in which the active material is formed out of the grids which compose the elements of the cells of battery; whereas, the Faure type is the one which takes advantage of the mechanical application of the active material.

Earlier methods, involving both generic types of battery, were long ago discarded in favor of more efficient ways of accomplishing the desired results. For illustration: In the Planté type

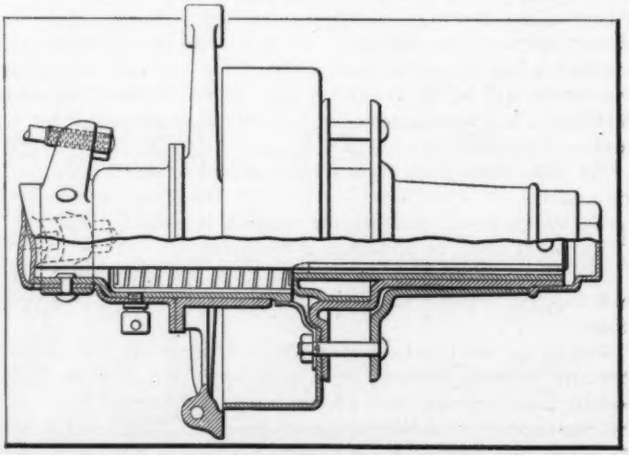

Fig. 4—Hyatt type of roller bearings as used in live rear axles

of battery, as it is made to-day, the grids are first "spun," an idea introduced by Madden and Chamberlain in 1896 (Letters Patent U. S., No. 572,363) and one now in vogue, especially for negative plates in Gould storage batteries. The spinning process is conducted in an especially devised machine, in which the sheets of pure rolled lead are placed and deep grooves are made by means of rotary knives, placed in gangs on a mandrel, so arranged that the original surface of the plate in each instance is increased enormously. The spun plates are placed (between dummies) in a forming electrolyte, and when a charging current is passed through the plates they quickly grow a deep coat of active material which completely fills the furrows.

In the Faure types of plates instead of subjecting them to a spinning process they are cast under pressure, using an alloy of lead and antimony to give strength. Then a lattice work formation of the moulds brings out the grids in shape to enable them to be filled with salts of lead formed into a paste. The active material is then readily formed and the ampere hour capacity of the batteries so made is found to be great in comparison.

In the earlier attempts to make batteries in this way, owing to lack of knowledge of the phenomena which transpired in the charging and discharging cycles, the materials failed to stay in place sufficiently long to satisfy the commercial needs. Then improvements made were mostly in this direction, it being the case that they gradually mounted to a high plane, and to-day as it can be safely said, in view of the rapid growth of electric vehicle enterprises, that the storage battery is stable, efficient and so commercially capable to meet all reasonable requirements.

WATT OUTPUT AND LIFE RELATED

Since a lead cell of battery has a potential difference of about two volts (between 1.8 and 2.2 volts, which is the discharging range), it is necessary to employ enough cells in series to make up the voltage for which the motor is wound, limiting the number of cells in series, however, to that number which, when charged in series, will permit of charging on the circuit available for the purpose.

When batteries are being charged there are times when the voltage should be on a basis of 2.6 volts per cell and with 44 cells in series (not counting "drop" in the wiring system) the charging voltage must equal 114.4, which, including probable "drop," brings the circuit voltage up to 120 as a low figure, it being true, as a rule, that the "drop," which may be quite noticeable in wiring, switches and connections, will equal more than five volts.

With 44 cells of battery in series, considering the average voltage on discharge as, say, 2 volts, the motor would be wound for, say, 90 volts, and the fields, which would be series wound, would take care of all voltage variations, since the exciting current would be the same as that entering the armature. In some cases, when the voltage of the charging circuit is down to 115, 40 cells of battery are used, and the motor is then wound for 80 volts.

When the battery, as respects the number of cells used, is not matched up with the circuit with which it will be connected for purposes of charging, one of two things must happen: (A) If the charging voltage is not high enough the battery will be starved, sulphation will take place and the life of the battery, also its output, will fall below the obtainable level. (B) If the charging voltage is excessive the battery will be destroyed, unless a resistance is inserted in series with the battery sufficient to cause a drop equal to the excess of voltage.

The right number of cells to use then is that number which can be correctly charged, considering the circuit available, and the motor for an electric vehicle must be wound for the mean voltage of the battery. These are matters of the gravest importance and probably the details which, being well cared for, have brought battery life, hence vehicle satisfaction, up to a very high level in the estimation of users.

With these matters properly attended to, it is possible to intelligently discuss the questions of watt output of batteries and so learn how it is that life and watt output are entwined.

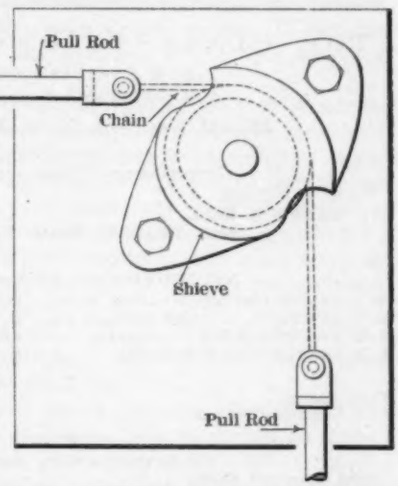

Fig. 5—Flexible cable and sheave as used with brake cables to make turns

The average electric vehicle of the pleasure type will run on a hard level road at maximum speed at, say 80 volts and 20 amperes, and, since volts by amperes equal watts, it follows that 80 × 20 = 1,600 watts, which, per hour, represents watt hours.

If the battery used under these conditions will furnish the necessary current in amperes, say, four hours, the watt output will then be (taking an average) 6,400, and if the battery weighs 400 pounds the watt output of the same will be on a basis of 16 watt-hours per pound of battery.

The watt output of a battery depends upon the conditions as follows:

(A) Surface of positive plates, assuming the negative plates are equal to the requirement, which is generally true, and in the better class of batteries, negative plate capacity is in considerable excess, thus affording long life.

(B) Weight of active material in positive plates, assuming the same to be capable of conversion; or, better yet, counting that portion of the positive active material which is converted during charge and subsequent discharge.

RATE OF DISCHARGE AND OUTPUT OF A BATTERY

Discharge Rate	Ampere Hours Output
In 10 hours	100
In 8 hours	98
In 6 hours	93
In 4 hours	82.5
In 3 hours	75
In 2 hours	65
In 1 hour	50

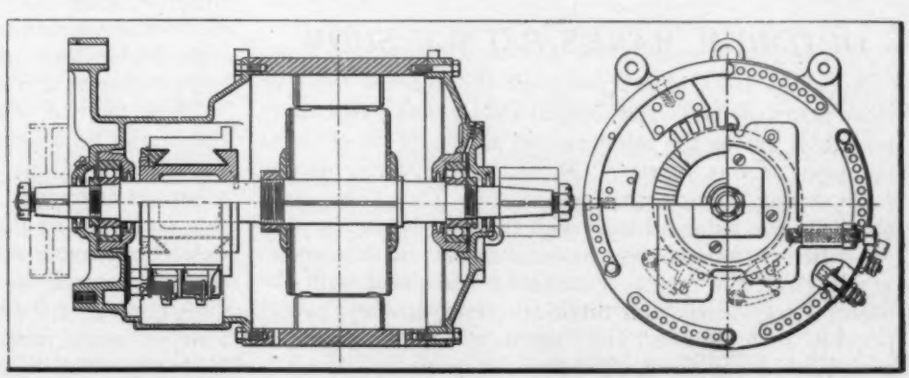

Fig. 6—Section of a ball bearing type of electric motor as applied to vehicles

THE AUTOMOBILE

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AN EDITORIAL ANNOUNCEMENT

After four years of service as managing editor of "The Automobile" there comes a severance of pleasant relations with The Class Journal Company, in order that I may assume new duties in a field that once before strongly appealed to me. From the national secretaryship of the American Automobile Association in 1906, I moved to the editorship which I am now relinquishing to become again identified with the A.A.A. as chairman of its Executive Committee and publisher of its official monthly magazine. If the readers of "The Automobile" share the expressed belief of The Class Journal Company that my efforts have contributed some additional interest to its pages, even in part, then I shall consider that the years spent were well employed. A. G. BATCHELDER.

OPTIMISM MARKS PALACE SHOW

Apparent from blocks away, all through the three or more floors of the Grand Central Palace, and particularly noticeable among the salesmen and agents, is the cheerful optimism of this year's A. M. C. M. A. Show, holding forth during the present week in New York City. Not alone are the public pleased with the fine, brave showing which the cars themselves have made, but their sponsors are jubilant, the factory representatives elated with the business transacted, and there are none worried, except possibly some isolated sales agent whose allowance of cars may be cut down.

As is usual, the decorations and arrangement of the building and exhibits are nearly as good as the ubiquitous press agents have been telling us they would be for some months past. The car exhibits, with perhaps one single exception, were in place for the opening, and the whole show was ready when it was supposed to be.

As indicative of the more remote future tendencies, the commercial section is very well filled with a fine class of cars, varying throughout the whole range of capacities and running the whole gamut of prices. Not this alone, but many of the pleasure vehicle manufacturers not previously numbered with this crowd either actually or in spirit, make the fact known that they are working on something in this line which will make every one concerned observe the result. Were these cases few and far between, nothing would be thought of them, but in the present instance they are numerous and widespread.

Many more makers take the stand that they are so busy trying to make as many pleasure cars as their agents sell that they have no time to even think of the commercial end.

Most noticeable among the details are the increased tendencies toward thermo cooling, long strokes, block cylinder castings, magneto predominance, and increased percentage of water-cooling systems. All of these—barring long stroke—may be taken as simplifications, which, in a word, is the predominant tendency. Radius rods and torsion tubes are missing, wheels and tires are larger, and all of the little details hardly worth mentioning here are improved, refined and brought up to, or, more correctly, ahead of, date. The present show is a fitting introduction to what is destined to be the biggest and best automobile year for all concerned, 1910.

AND NOW, THE LICENSED SHOW

In that city of rapid transit, New York, those inclined toward the automobile and its parts will this week be given the chance to show their skill in the rapid change line, for following closely upon the A. M. C. M. A. show, the show of the licensed body known as the Association of Licensed Automobile Manufacturers will be opened to the public.

Among the ranks of the latter, the percentage of makers catering to the class of buyers who inquire the price last instead of making it the controlling factor is much greater than at the show which will just be closing at the time this one opens. This higher percentage of higher-class cars without a doubt will give the latter exhibition a somewhat higher tone; the cars themselves will doubtless be more elaborate and more highly finished.

Then, too, the setting in the historic Garden—now, if rumor can be believed, about to be razed to make place for a more prosaic structure—has always been such as to attract many who would not visit the other house. All this combines to throw about the A. L. A. M. annual exhibit a glamour which there is no gainsaying. This is very desirable to the exhibitors, for the bigger the attendance, the bigger the sales, if not at present, at least in the near or more remote future. The whole spells more business, which in the last analysis is the actual reason for all shows of this character.

ANNUAL MEETING SOCIETY OF AUTOMOBILE ENGINEERS

THE fourth annual meeting of the Society of Automobile Engineers—first session—was opened on Tuesday at 10 a. m. in the Assembly Room of the Automobile Club of America. The meeting was attended by about thirty members, President Henry Hess in the chair. The morning session was given up to the discussion of various matters for the good of the society, including the appointment of automobile publications to receive and publish the papers of the society, arrangements having been made by the council whereby the publishers of the leading automobile papers contribute largely to the funds of the society for the use of its technical papers and other material.

On adjournment of the morning session the members of the society were tendered a luncheon by the Automobile Club of America in the grill room adjoining the meeting room, which occupied the attention of the members until the meeting in the afternoon at 2 o'clock, at which time, in the regular order of business, the following papers were read and discussed:

The effect of frequent and heavy charging upon pasted lead peroxide plates, by Hugh Rodman.

A graphic determination of chain-speed gear-bearing loads, by L. C. Freeman.

Characteristic curves of internal combustion motors, by B. D. Gray.

These papers proved to be of unusual interest because they were of a character which might well be designated as "all meat." The storage battery paper was apropos in view of the wide activity which now dominates the electric vehicle situation, and the paper, when published, should prove of exceeding value, particularly to those who have the maintenance of electric vehicles within their charge. It will, of course, have a secondary interest to the owners of electrics. The paper in relation to chain-speed gear-bearing loads, while it is of a technical character in accentuated form, is most comprehensive, nevertheless, and covers divers important points, clearing up things in relation to which engineers have been in controversy.

Mr. Gray's exposé of the characterictic curve situation has the especial merit of tersely pointing out conditions which should lead to a final and better understanding of the abilities of internal combustion motors, and the paper should lead to intelligent and profitable discussion, which is what Mr. Gray hopes to bring out.

At the close of the technical session the chairman announced that a paper discussing some causes of failure of automobile gears would be read by Dr. Sargent at the January 13 meeting.

WHAT IS TO BECOME OF THE A. C. A. DYNAMOMETER

It will be remembered that the A. C. A. installed a special automobile testing dynamometer, which was designed by Dr. Schuyler Scatts Wheeler and installed at the club with the expectation that it would serve as a means by which club members, when they purchased automobiles, would be able to ascertain if the makers lived up to the expectations of the purchasers. This dynamometer is a most ingenious device, capable of many things, and what to do with it is the matter which was broached at the meeting to-day, with the hope, perchance, that this body of engineers, collectively, might be able to suggest a method by which the excellent virtues of this testing machine could be spread out over a more diversified zone of usefulness.

Alden L. McMurtry, chairman of the technical committee of the Automobile Club of America, invited the members to witness tests of an automobile type motor and also a radiator in the laboratory of the club, and an adjournment was made to the top floor of the building where the testing appartus is installed. Mr. McMurtry said that the question of making certain changes in the club's dynamometer was being considered by the technical committee of the club. It had been proposed to adapt the instrument to take power readings from the hubs of the rear wheels of a car under test instead of transmitting the power by the contact of the rear tires with wooden drums. In this way the error introduced by the condition of the tires would be eliminated.

In a general discussion of the dynamometer in which the members of the Society were asked to express their views, Mr. Cave suggested that automobile builders be requested to submit cars from their factories which would be typical of their average practice, and tests made with these cars could be adopted as standards for comparison. It would thus become possible for a user of any car to have it tested and its performances compared with those of the standard factory car, so that any deficiency could be noted.

It is understood that the board of governors of the club contemplates the sale of the dynamometer in case the proposed modifications are not put into effect.

Pursuant to notices sent out by Secretary Churchward, the first of the two annual dinners to be held during the Shows was held in the Grill Room of the Automobile Club of America at 8 o'clock. About sixty members and guests were present, after which the meeting adjourned until the second session to be held at the Engineering Societies Building, on January 13, which will be followed by a dinner at the Engineers' Club in the evening of the same day, after which the Society will be turned over to the new officers for the ensuing year.

It was a graceful act on the part of the A. C. A. to place its beautiful club house at the disposal of the engineers, but the board of directors of the club reached the hearts of the S. A. E. membership through the most diplomatic channel known to man, which took expression by way of a mid-day luncheon, which very aptly bridged over the recess which was taken at that time. In recognition of the splendid hospitality of the club, the Society, before the termination of the evening at the banquet, tendered a vote of thanks to the A. C. A.

FUTURE OF THE SOCIETY LOOKS BRILLIANT

When the Society of Automobile Engineers first started, and A. L. Riker took the presidency over five years ago, it was a baker's dozen of enthusiasts who assembled there and bravely assumed responsibilities of charter members. To a casual observer the situation looked discouraging in view of the then activities of the mechanical branch of the A. L. A. M. These staunch advocates of an absolutely independent and untrammeled society used excellent material for a foundation, and after events proved that an association of engineers to accomplish the most good must enter the assembly hall dressed in their own minds, and free to express such sentiments as they may care to voice, with a feeling of perfect independence, enjoying the distinction of doing as they see fit.

Commercialism has never been welcome in this Society; it stands for abstract engineering, and it has in its body upwards of 300 members at the present time, they coming from the engineering offices of the most representative companies who are devoted to the building of automobiles in America, and to some extent from abroad.

The Society has what is designated as an International Membership, which permits engineers from foreign societies to take out a membership in the S. A. E and to participate in the advantages which are derived therefrom.

SALIENT FEATURES OF THE A. L. A. M. SHOW

OPENS Saturday evening, January 8, and closes Saturday, January 15. The show is open to the public daily, except Sunday, from 10 a. m. to 11 p. m. Society days are Tuesday and Thursday, when double admission will be charged.

Three hundred and twenty-three exhibits, including gasoline, electric and steam pleasure and commercial vehicles, chassis, bodies, motorcycles and all sorts of parts and accessories, machine tools, automobile apparel, etc.

Forty-two exhibits of standard American pleasure cars; 12 exhibits of commercial cars, delivery wagons, trucks, buses, taxicabs, ambulances, fire wagons, etc.; 23 exhibits of motorcycles; 243 exhibits of accessories and parts.

Total value of exhibits, $2,250,000, $250,000 more than in 1909.

More than $35,000 has been expended for decorations.

Lowest priced car, $750.

Highest priced car, $7,500.

Expected attendance, 150,000 persons.

Expected attendance of carriage dealers, 2,000.

Expected attendance of automobile dealers, 5,000.

One of the most pretentious displays of automobile trophies ever seen in America. Among them are the Vanderbilt Cup, the Glidden tour prizes, the Indiana trophy, the Massapequa Cup, the Merrimac Valley Cup, Brighton Beach 24-Hour Race trophies, the Dewar Cup, Sewall-Alden, Tanforan, Thermoid, Lowell, Fairmount Park, Detroit and Dead Horse Hill Climb Cups.

Decorative scheme—main floor: A Roman amphitheatre. White and gold are the dominant colors throughout the whole decorative scheme, although green and crimson are also strongly in evidence. More than 7,000 yards of blue bunting are used for a canopy, concealing the girders of the roof. A score of arc lamps with colored shades hang from the roof, and thousands of incandescent lamps twinkle in the canopy. Over 6,000 square yards of carpeting are used for flooring of the car exhibits.

Thirty Doric columns, each 25 feet high and topped by the show emblem—an eagle on a wheel—add to the beauty of the decorations. Fifty ornamental lamp-posts mark out the spaces on main floor and thirty on the elevated platform. A decorative Roman seat faces the Garden arena entrance. It is backed by an electrically illuminated fountain filled with goldfish and pond lilies.

The Exhibition Hall contains a novel latticed arbor, and an immense rosette and twenty-four white sunbursts hang from center of hall.

The Concert Hall exhibits appear beneath a canvas tent ceiling similar to that of a circus tent.

In the basement a Dutch-Colonial rathskeller, painted in cream white, adorned with autumnal foliage, is a feature.

The exhibition is under the management of the Association of Licensed Automobile Manufacturers. Show committee: Col. George Pope, chairman; Charles Clifton and Merle L. Downs, secretary.

MEETINGS DURING GARDEN SHOW WEEK

The week of the Tenth National Automobile Show, in Madison Square Garden, January 8-15, will be a busy period for the automobile enthusiast and those actively connected with the industry. Many firms and organizations have planned dinners, meetings, etc. Apart from entertainment features there will be a lot of doings of serious sort on the part of various organizations. Events that are scheduled definitely are:

Tuesday, January 11

Meeting of Executive Committee of the American Automobile Association, 10 A. M., at National Headquarters, 437 Fifth avenue. President Lewis R. Speare will preside.

Wednesday, January 12

Meeting of Executive Committee of the National Association of Automobile Manufacturers, at Hotel Victoria, 10 A. M. The annual meeting of the Association will be held at the same place at 11 A. M.

Meeting of Legislative Board of the American Automobile Association, 437 Fifth avenue, 11 A. M. Charles Thaddeus Terry will preside.

Thursday, January 13

Meeting of the Society of Automobile Engineers at the Society's building, 25 West Thirty-ninth street, 10 A. M. At 8 P. M. a dinner will be held.

Meeting of the directors of the New York State Automobile Association, 10 A. M., at Hotel Belmont. President H. A. Meldrum will preside.

Meeting of the Touring Information Board, at headquarters, 2 P. M. Chairman Powell Evans will preside.

Meeting of the Show Committee and Committee of Management of the American Motor Car Manufacturers' Association at headquarters, 505 Fifth avenue, 10 A. M.

Friday, January 14

Second annual reunion of the A.A.A. State and Club Secretaries at headquarters of the Association, 10 A. M. Secretary Frederick H. Elliott will preside. Luncheon at 1 P M.

The Association of Licensed Automobile Manufacturers will hold meetings during the week, as will also the Importers Automobile Salon.

ENGINEERS WILL MEET IN JANUARY

Meetings of the American Society of Mechanical Engineers will be held in New York on Jan. 11, in St. Louis on Jan. 15, and in Boston on Jan. 21. The New York meeting, which will be held in the Engineering Societies' building Tuesday evening, Jan. 11, just in time to catch all of the engineers visiting the Metropolis then for the A. L. A. M. Show, will discuss mainly lubricating oils and lubrication. The paper upon "Efficiency Tests of Lubricating Oils," by Prof. F. H. Sibley, of the University of Alabama, will be presented and important contributions upon the properties of lubricants, their efficiency, durability, characteristics, etc., will be made by Dr. C. F. Mabery, of Case School, Cleveland. and General Charles Miller, of Franklin, Pa.

This subject of lubrication is so important in its bearing upon the conservation of power and upon machinery of all kinds, especially since the introduction of recent new types, such as the steam turbine and automobile, that it is desirable to have authentic information easily available for the use of engineers.

The president of the Boston Society of Civil Engineers will also outline what his organization has accomplished toward a project that has been under discussion for a united engineering building, to be occupied by the societies in that vicinity.

SHOW SMALL, BUT A BUSINESS-GETTER

COLUMBUS, O., Jan. 3—While the attendance was not all that was expected, the first motor show held in Columbus under the auspices of the Columbus Automobile Club, which closed New Year's night, was a success. The dealers were enthusiastic over the number of cars sold and prospects secured. While it has not been stated officially, the rumor is about that the show will be made an annual affair.

Impressive in the extreme were the closing scenes. All the exhibitors and assistants, headed by the electric cars and the band, paraded the hall before the show was declared closed.

THE STORY OF THE A·M·C·M·A SHOW

WHEN Acting-Mayor McGowan pulled the cord which opened the silken curtain concealing the electrical marble fountain at the end of the main hall of the Grand Central Palace on New Year's Eve, after a short, felicitous speech, he disclosed the central figure in the most elaborate and easily the most spectacular, decorative show scheme ever attempted in the now-famous Palace.

Not only did the show committee of the American Motor Car Manufacturers' Association, which fostered and, in fact, engineered this, the Tenth International Show, set out to outdo previous shows and previous decorative schemes, but what is of vastly more interest, they accomplished it. The main idea of the decorations was that of a garden. With this idea as a starting point, the roof trusses were hidden with a canopy representing a garden trellis nearly covered with growing vines of green.

On the exhibition floors the same trellis idea was carried out, the large spaces of the walls being painted with panels which purported to represent floral scenes both at home and abroad. The lattice or trellis work was made effective and seemingly real by the well-selected colors—Nile green, with a background of Caen stone. Through the canopy overhead, what was apparently the blue sky was to be seen, the colors being well simulated.

Signs of raised Egyptian letters, gilded, on a green background, together with a green floor covering, and very dark mission furniture, carried the scheme through, even to the uttermost corners of the very highest of the many high balconies, for the space demand was such that every available nook and cranny were used.

Although the hour at which Acting-Mayor McGowan opened the show was but eight o'clock—unusually early for the Metropolis—a large gathering was on hand. With such a good start, the attendance has been heavy right through to date, and at the time of going to press it is, if anything, greater than on the opening night.

The first showing of the 1910 cars was well worthy. Despite the talk about lower prices and more low-priced cars, the market as a whole showed firmer in tone, and, if anything, there were as many makers raising prices as there were of those who lowered them. By a natural law of compensation the situation thus adjusts itself, the increases balancing off with the price cutting, so that the man who was looking for a price landslide was left as far from a choice as ever.

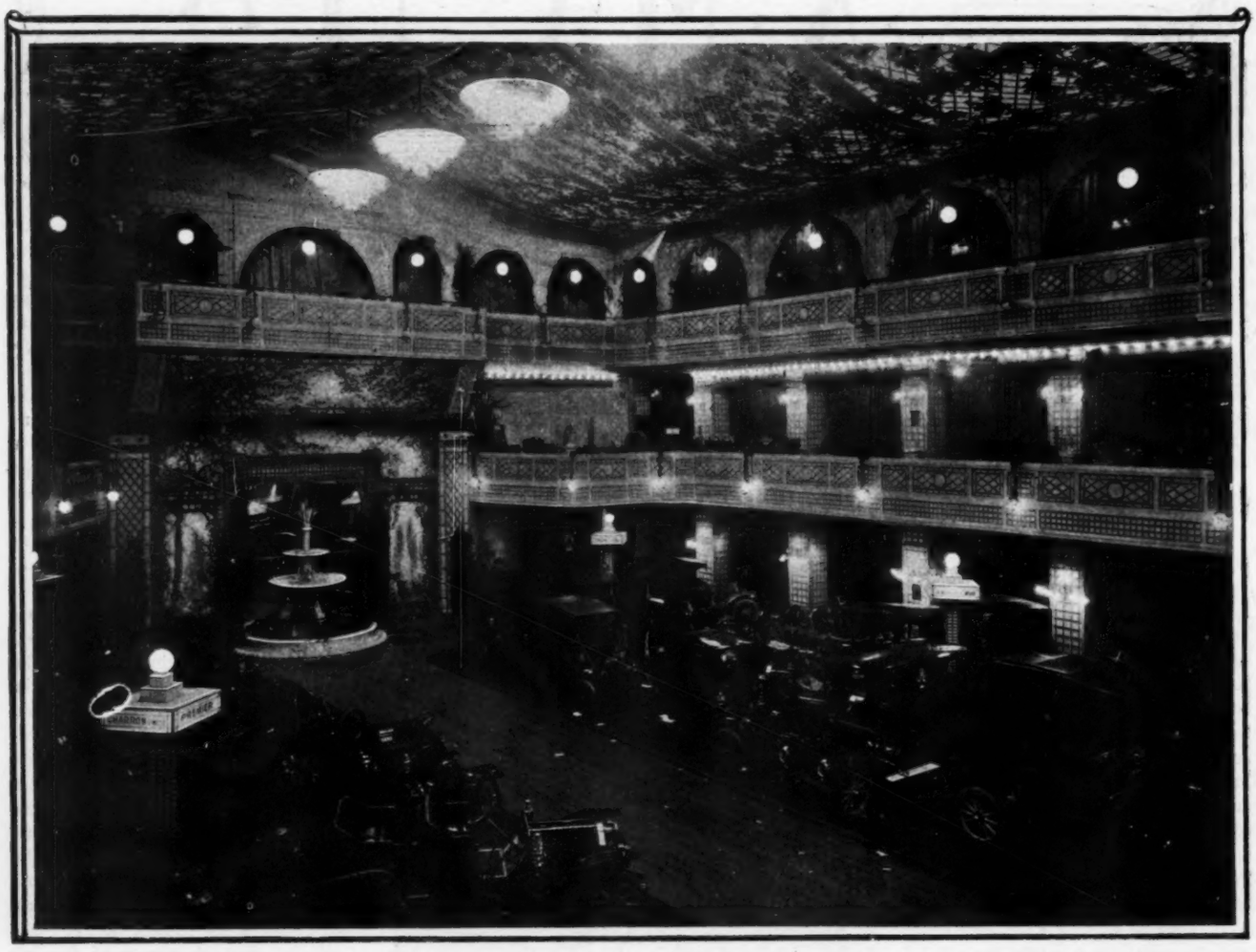
Society was out in force at all times, not alone for the formal opening and the equally formal day which followed, New Year's being "dress-suit" day, but at all times the society leaders were there, delighting alternately at the more recent foreign importations and the latest products of American skill and ingenuity. Following the visits of the "400," with which society set its stamp of official approval upon the show, the "4,000,000" making up the proletariat, began to flock in, and they have been flocking ever since.

One of the tendencies shown abroad, at the great Olympia show, to be specific, was the general adoption of the dashboard, radiator and sloping bonnet, made famous and always featured by the French houses of Renault and Charron, popularly called C. G. V. This same tendency was to be noticed, in a much smaller way, however, at the Palace exhibition, one of the most prominent newcomers in the small-car class, listing at close to $1,000, using this useful and highly ornamental form. This, following closely upon the success of a middle Western firm with the same construction, will, without a doubt, pave the way for the general adoption of more of the same.

While the small single sales have not been large, or, to be more exact, have been very small, this is a method of selling cars which nearly every manufacturer now frowns upon. This is barring, of course, the honor of making the first actual sale after the show is officially opened, for which there was this year, as always, much sharp competition. The small individual sales have been small, but, to offset this, the sales to dealers and agents have been unusually large, and many factories have entirely disposed of the 1910 output in this way.

In this category the number of makers were many, and the sales managers of those concerns were, according to their dispositions, either tickled to death or just the opposite. One manager was complaining that his whole year's work had been cut off short by this show, for the factory capacity was all booked, and so he had nothing to do until plans could be made for the 1911 models and factory production. Being so very busy getting out this year's business getters, there was little prospect of this being settled for a long time, which meant

· THE · A · M · C · M · A · SHOW ·



Central Portion of Main Exhibition Floor Showing Fountain at Western End and Lattice Work Decorative Details

enforced idleness for that space of time. For a hustler, as most sales agents are, this is the hardest kind of hard work.

Saturday was set aside as Army and Navy night. In previous years show managers had to be content with the Army only, but the presence in New York harbor of the big gray Atlantic squadron made the double-purpose evening possible. The blue-jackets manifested an unusual amount of interest, while the officers of the fleet were out in force, not alone on the night set aside for them, but at all other times as well.

When the management set aside Tuesday as Society day, and boosted the price of admission to an even dollar, it was thought that only the care-free rich would "give up" to that extent. Many entertained the thought that on this day a visit would be worth the extra money, for then the crowds would be less and more of the show would be visible to the naked eye. Perish the thought! For whether there to see the cars or to view the Paris (and other) gowns, the fact remains that the crush on that day even exceeded the previous day, to say nothing of those following.

Torpedo, gunboat, bathtub and similar bodies were shown in several of the exhibits and were well and closely examined. It can not be said that the public has taken to them with the avidity which was expected, but still the interest which has been awakened in this form—not a freak, but a useful one—has more than paid the few bringing out this type for their missionary and educational efforts in the body-building line. It is freely predicted that as soon as this form takes hold of the popular fancy all other previous styles of fast runabout bodies will become obsolete.

Sharing the automobile world topics of conversation with the big show at the Palace were the private shows. These were more numerous than ever before, and were not confined to the largest and most exclusive salesrooms by any means. The unusual demand for space had led Manager Reeves to lessen some of the spaces, this at a time when the exhibitors would have been pleased to get addititonal space. The result was that many makers changed their exhibits several times during the course of the week, one commercial car manufacturer changing his entire seven vehicles for seven additional and different ones during the eight days of the show. Most of the larger members of the foreign contingent followed this example, showing in this manner twice as many cars as would otherwise have been possible. The private shows along Broadway's Automobile Row were thus bigger and much more numerous than any previous two or three years taken together.

Summing up, it may be said without any poetic license that this year's A. M. C. M. A. Show will go down into history as the biggest and best ever. Manager Reeves and his corps of capable assistants may well be proud of their work, for the exhibit which opened at the Palace on the last day of the old year easily excelled all of its predecessors in every way.

· THE · A · M · C · M · A · SHOW ·

GIST OF THE PERTINENT MECHANICAL FEATURES

INTERESTED spectators, being the possessors of much mechanical skill, particularly of the character which relates to automobiles, see through the proverbial twenty-one applications of "rough stuff" and "finish," and they see right. Before taking up the strictly mechanical features of the running gear proper, spectators were afforded a wide opportunity to examine the body creations of the year, and many of them were, no doubt, interested greatly in the little cars and their natty types of roadster bodies, observing that the steering wheel had a rakish tilt, and that the seat was set back close to the vertical line of the front of the rear wheel for the back of the seat, and the gasoline tank, round or elliptical, occupied the balance of the space.

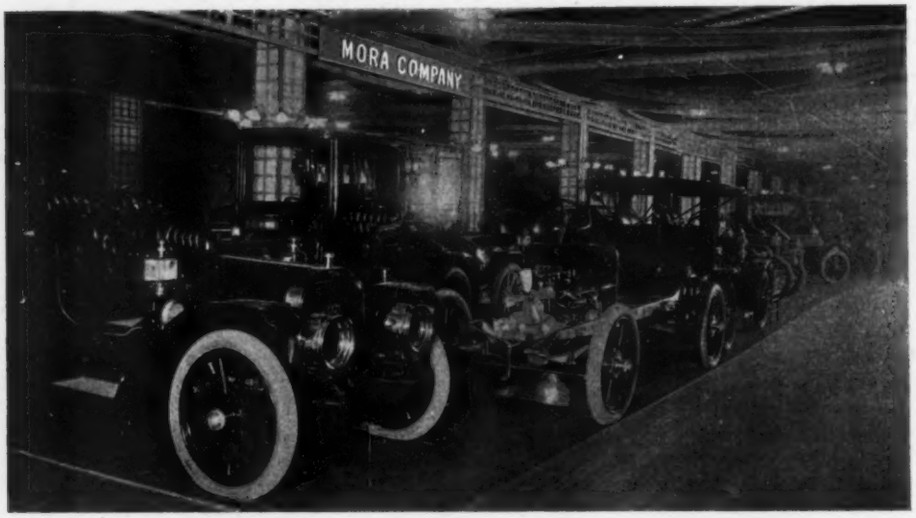
These types of bodies were very cleverly exemplified in the Model Q Maxwell, Paige-Detroit, and the friction drive Carter-car. In the Mora 20, however, instead of a gasoline tank back of the driver's seat, a trunk, of nice design, occupies this space. The Hupmobile has a perfectly oval tank to the rear of the driver's seat, and, it being finished with the body, makes for the whole show much of style and contrast. The Brush runabout, of the racy type, has a gasoline tank above the chassis line back of the rear seat, but purchasers are offered the option of the same type of car with a platform to the rear of the seat.

Among the toy tonneaus which attracted the notice of a discriminating audience, the Model K 10 Pullman offered evidences of refinement by way of a wide side entrance, luxurious upholstery, and fine finish. The Atlas 60-horsepower two-cycle was fitted with a long and low toy tonneau, the effect being brought about by the short height of the underbody, overhung dash, and long bonnet. The Cole "30" was commented upon favorably by the many visitors who observed that the foot room for the driver was very ample, and that the control system in this car is very nicely situated. Moreover, while the car ranks as a toy tonneau, nevertheless the commodious rear seat, with its rich upholstery, puts it in a class which, a year or two ago, would have been looked upon as a monster touring car. One of the Marmons in the toy tonneau class attracted a great deal of notice for all the reasons of fine body construction, and particularly on account of the commodious side entrance, excellence of mudguards, and fine finish. The Gaeth Type XXI was one of the excellent representatives of Cleveland, Ohio, in which the body work partakes of the qualities of a hunting gold case for a chronometer.

TORPEDO TYPES OF BODIES IN EXCELLENT PRESENCE

The automobile public has been expecting something by way of torpedo types of bodies, and they were not disappointed. The

Main Exhibition Hall of Grand Central Palace, Looking Toward the Main Entrance at the Eastern End



Section of Main Floor Devoted to the Pleasure Car Exhibits

Stoddard-Dayton was there, it being with almost a perfectly smooth exterior with two wide side entrances, an overhang dash, and a rather abrupt rear termination. The curve of the overhang of the dash presented a neat appearance, being shaped to act as a "dodger," thus deflecting the wind upwards and above the head of the driver.

The Speedwell torpedo type of body, as exhibited, proved to be in some contrast, due to the flattened overhang of the dash, and the effect on the general appearance of liberal-sized mudguards, flaring down to the chassis frame, and serving a very useful purposes, besides a pleasing effect.

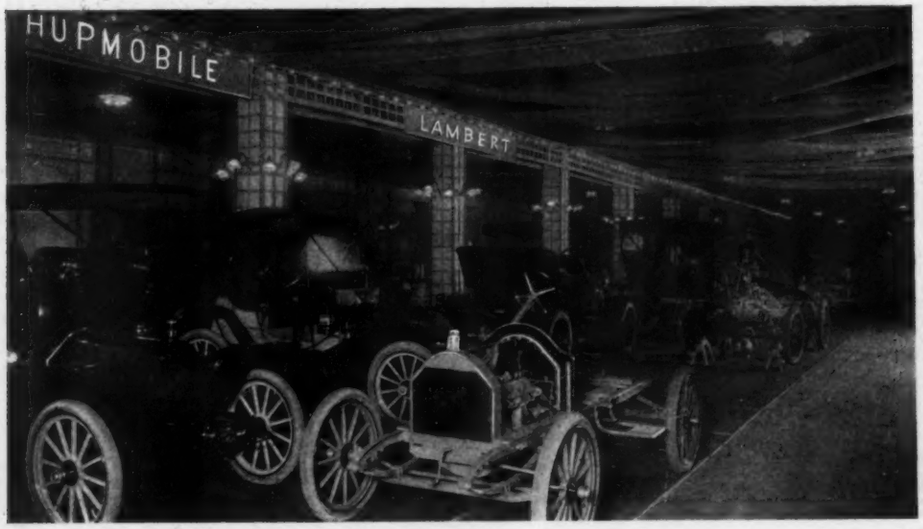
The many types of touring cars, looking a little smarter than heretofore, had a liberal sprinkling of steel bodies made by properly shaping sheet steel over stout, suitably ironed wooden framing, resulting in very serviceable work, over which the finish presents all the evidences of carriage refinement, and permanence becomes one of the most conspicuous features. Aluminum body work is on the highest possible plane.

SYSTEMS OF IGNITION UTILIZED

Without attempting to definitely place the respective systems of ignition employed, it will be the purpose here to emphasize what seems to be the positive trend in ignition service, in which magnetos take the brunt of the work in every case, the following makes being in widely distributed use:

U. & H., both in the dual and self-starting types; Remy, Eisemann, Kingston, Herz, Splitdorf, Pittsfield, Witherbee, Hess-Bright, and Bosch. In some cases the Atwater-Kent unispark system takes precedence, and low-tension magnetos obtain in wide-spark work, as in the Premier. Coils, in supplementary ignition work of the various well-known makes, are used in all excepting a few of the smaller cars in which but a single system, that a magneto, is depended upon.

Demountable rims seem to have taken a hold of the autoing public to a greater extent, perhaps, than any other one feature, and among the demountable rims exhibited there is the Diamond, which is a strictly demountable type, with a considerable space under the clincher so that the silt of the road when it forms into a cement-like paste will not cause the clincher to adhere sufficiently to be a source of annoyance. The Firestone demountable rim has also the detachable idea, and, since the rim fetches up against bevel seats, it seems to offer attractions, judging by the crowd. Then there is the Howard idea, in which a worm and wheel, when given motion, causes a right and a left-hand thread, turnbuckle fashion, to tighten or loosen the rim, merely depending upon the direction of turning. The Michelin demountable rim, using a clincher without a brake, is held in place by means of lugs, with through bolts, and the Universal demountable rim has a brake in clincher, thus bringing it in the class of demountable and detachable, and a very novel system of locking, which is actuated by means of a socket wrench, tightens or loosens the rim on its supplementary band with almost no effort, but the security offered is adequate for every need. The Nadall demountable rim is also detachable, in which the clincher is parted, and the two halves are mounted on a supplementary rim, which in turn is locked after being sprung into place, and the whole, with the tire inflated, after it is put into place, is slipped over the felloe and fetched up into place against 45-degree bevel faces by means of alloy steel clamping bolts in such a way that bending moments are absent.

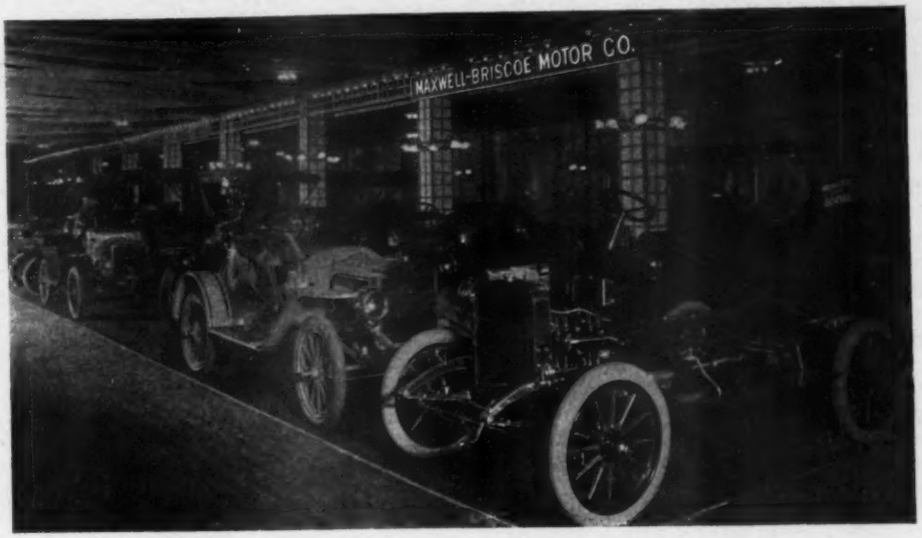


Another View on Main Floor That Showed Careful Arrangement

NON-SKIDS MUCH IN EVIDENCE

From the Firestone, which prints its trade-mark as it goes along, to the Morgan & Wright, which has the embossing in rounded quadrangle formation, is a considerable distance to a casual observer, but the principle is the same in either case, and from the latter to the Republic staggard tread represents but a difference in the manner of placing the embossed figures. Then there is the Ajax non-skid, with a diamond formation, but with this difference: instead of the figures being embossed, the grooves between the figures are sunk. The Calmon is of the conventional form, studded, and the Kempshall, which is called an anti-

skid, takes on the appearance of efficiency. From these and other types of non-skids to the Goodrich-Palmer tread idea, which is very popular in connection with electrics, represents the two extremes in tires as they are used in automobiles, in which the non-skid types are considered essential to comfort and safety in connection with touring cars, and the Palmer web, with its ten light plies, offers attraction in that the tire losses are reduced to the absolute minimum, and life is sufficiently long to answer every practical requirement.



Here the Aisle Was Wide, Affording Opportunity for Inspection

Much of the tire success which has been observed of late is due to the use of larger diameters and greater sections. In other words, it is better to pay twice as much for tires, if they will last four times as long, and there seems to be no doubt about the lasting qualities, when the sizes are sufficient to carry the weight without flexure to more than a nominal extent.

In wheels, despite the claims of some, the second-growth hickory employed, which comes from Missouri, is of an unexceptional grade. In view of the circulation of canards in relation to the scarcity of this grade of wood, it comes as a surprise, in a way, to discover that automobile wheels, almost without exception, are selected with the utmost care as respects this material.

Twelve spokes are the rule; they are nicely shaped, and dished wheels take precedence in the majority of cars. Hubs are from drop forgings, or steel castings, and roll on annular types of ball bearings in some cases, conical roller bearings in other examples, and the Hyatt flexible type of bearing finds a wide use in live rear axles.

EYE SECTION DROP FORGED FRONT AXLES

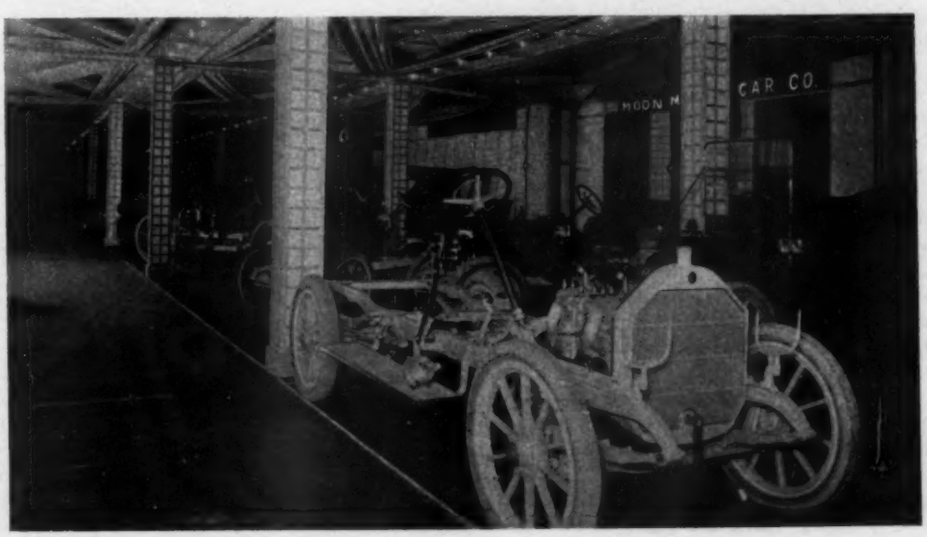
Eye-section front axles are now in such common use that they may almost be regarded as standard. Fortunately, they are drop forged in one piece, thus eliminating welds, utilizing highly kinetic material, usually basic in its characteristics, with well-regulated carbon, and low in metalloids. Steering knuckles are of the several well known types with hardened metal pins, bushed, and grease cups are present in nearly every case.

DETAILS OF POWER PLANTS

It is extremely interesting to pass along from booth to booth and listen to the arguments of the clever salesmen who, in explaining the top features of their products to a receptive audience, delve into technics, with never a thought as to whether or not the audience is familiar with this strange and weird language. Perhaps they have learned, some of them to their sorrow, that the audience is fully alive to the difference between a needle valve in a carbureter and a gudgeon pin for a piston. Maybe they learned, perhaps too late to save their dignity, that this same audience grasps the idea of the overlapping valve, and knows perfectly well that popping in a carbureter is not at all due to weak mixture; that popping in a carbureter will not take place at all if the speed of traveling of the mixture in route to the combustion chamber is greater than the rate of flame propagation in the body of the mixture itself within the intake manifold. In all events, the power plants, as they were exhibited, taking them as a whole, embodied such fine details as the proper proportioning of the intake manifold, thus assuring that the speed of the gas en route to the combustion chamber will exceed the speed of the flame, and overlapping in the valve timing becomes practicable.

Well-regulated compression aborts carbon formation in so far as coking out will transpire in the gasoline component of the mixture, and this particular improvement eliminates to a very considerable extent the contention that lubricating oil is at the bottom of carbon trouble. On the exhaust side of the motors, taking them in general, there are finger prints of the fine Italian hand of the designer which indicate that the ejector idea is stalking forth, and, instead of a considerable back pressure, which kills power, there is something of a vacuum which coaxes the spent products of combustion away from the combustion chamber, thus adding materially to power and flexibility.

Just now there is a tendency to utilize the nozzle idea in connection with the exhaust, and it has been found by experimenting, and through experience, that the idea is good.



Looking North Along the Lexington Avenue Side of Main Floor

ADDITIONAL REASONS WHY ONE SHOULD BUY

IT has been truly said that show time is not slow time, for at that season of the year makers, selling agents, advertising men, and even the editorial staffs are very busy, too much so to attend to everything. In this hustle and bustle something must be overlooked. It never fails. So it happened that many of the "Reasons" intended for last week's issue reached us too late for publication. Many of those used, too, were not written especially for this column, as had been intended, which accounts for repetition in the late comers given below.

CAMERON: G. N. Jordan, Sales Manager—Of the total number who will purchase automobiles in the United States in 1910, about 90 per cent. will buy for business purposes, and to such purchasers economy is one of the most important considerations; economy in the use of gasoline and lubricating oil, in tire consumption, and in time.

We have designed the Cameron car with these points in mind, and believe we are offering the most economical and practical car for the following reasons:

No water is carried.

On the Cameron system of cooling the excess heat is carried off by a natural circulation induced by hot air rising from the cylinders as fast as it is radiated, and cold air rushing in beneath to take its place around the cylinder wall.

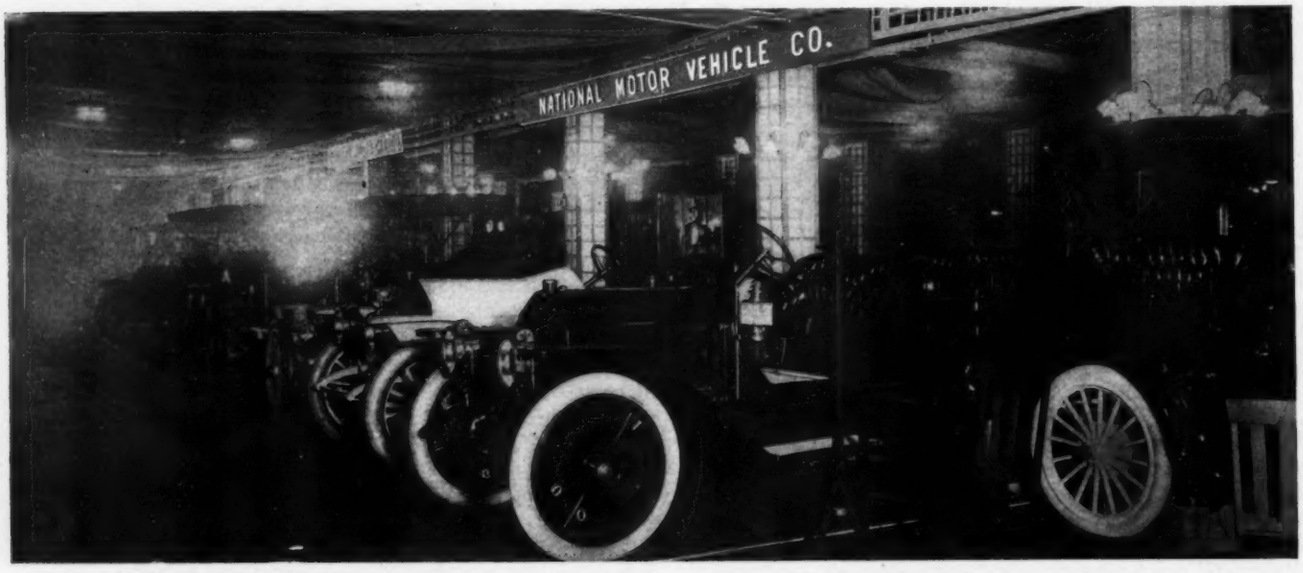
When the engine is running light very little heat is radiated off and the circulation of air is naturally slow, keeping the cylinder walls at the proper temperature. When the car is driven hard and more heat radiated off, the circulation becomes faster just in proportion to the amount of cool air required and, on being operated under all conditions at an even temperature, develops its power on smaller consumption of gasoline and lubricating oil and gives longer life to the wearing parts of the engine.

The Cameron transmission system is direct drive on every speed; all our cars are equipped with three forward speeds. This gives the operator the proper range of gearing for any condition of road, allowing the engine to be operated at its most efficient speed.

In changing gears, the gears throw opposite each other and roll naturally into mesh without the danger of wrecking (as in the sliding gear system), especially in the hands of inexperienced operators.

The high efficiency of the transmission on all speeds is an important factor in keeping down the fuel consumption, and, by leaving off water-cooling apparatus, we are able to reduce the weight of the car 200 pounds, reducing the wear on tires. The car being high powered in proportion to weight, will start quicker from a standstill, will pick up quicker after turning corners and be more economical in time in getting from place to place, even though driven at no higher extreme speed than the heavier underpowered type of car, which requires a long distance to get under way.

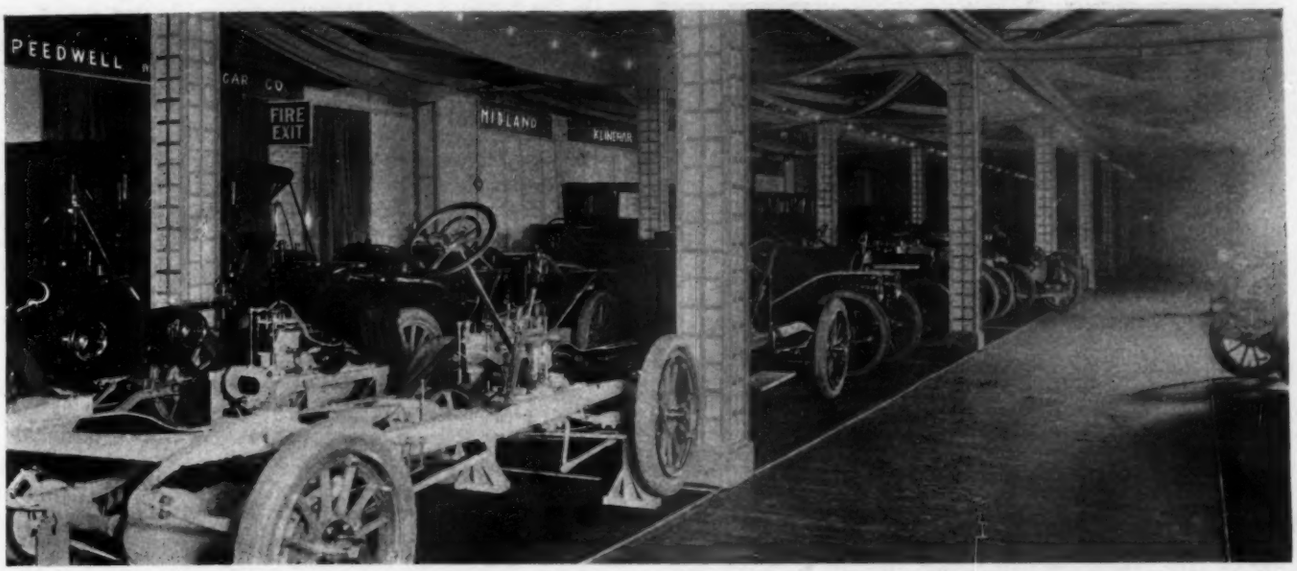
The Cameron car is not an assembled proposition, each part is designed and built to fit the other part with the main object in view of giving our customers the most economical car on the market; and, by economy, we do not mean fuel economy alone, but economy of upkeep and economy in ease and rapidity of handling. And it is the ideal car for the busy business man who must have highest efficiency, and a car that is always reliable and ready to start regardless of weather condition; a car that can be stored in an ordinary small home garage without heat, and can be left standing indefinitely in zero weather; a car that, when extreme occasions demand, can be driven at terrific speed all day long without overheating, radiators boiling out, causing delay to refill, or other defects peculiar to the water-cooled type of car.



Section of the Main Floor on Forty-fourth Street Side Where Many Middle West Makers Were Located

GRABOWSKY: Sales Department—In buying a commercial vehicle, the purchaser must necessarily take an entirely different viewpoint than that taken in buying a pleasure car. He has primarily these facts to consider, ability to give continuous and efficient service, economy and advertising value.

Economy has many factors, the least of which is first cost, if reasonable. Economy of maintenance and up-keep are lowest in the Grabowsky car for these definite and easily proven reasons: Maintenance. The very first requisite of cheap maintenance is absolute accessibility. This the Grabowsky alone has by reason of its removable power plant, in which the motor, transmission and levers are a unit, which slides out or, when out, is shoved



Showing the Distribution of Many Leading Exhibits on the West Side of the Palace, Facing Main Hall

back into the car just as is the drawer of a desk, thus every adjustment is at the chauffeur's finger tips.

Second, the Grabowsky has hardened steel bushings in every working connection. No necessity to renew whole parts at a considerable cost; just replace steel bushings at a very low price.

Third, highest grade of materials used throughout the car. Mr. Grabowsky's long study of and familiarity with steel and iron relative values assures best results here.

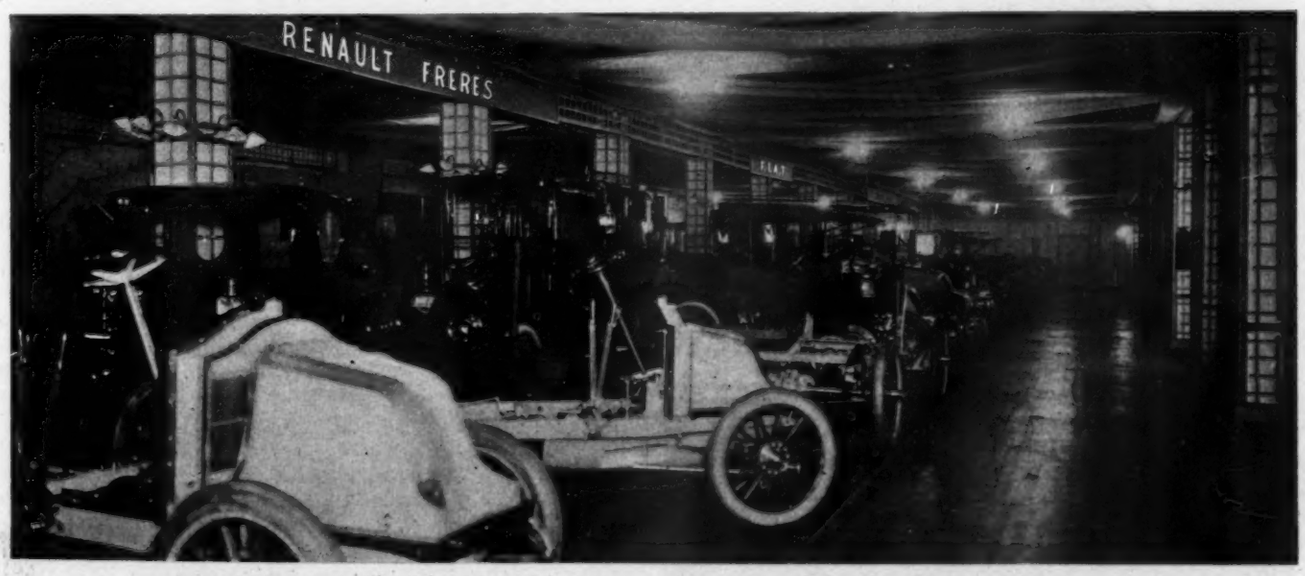
The second factor, economy of up-keep, is worth discussing. First, the Grabowsky lubricating system, by means of a vacuum crankcase and a fine application of the laws of attraction, uses its lubricating oil over and over again, thus saving fully one-half the cost of oil.

Second, a two-cylinder opposed motor uses far less gasoline than a four-cylinder motor. Moreover, there is less weight of parts to carry in a two-cylinder motor than a four cylinder and every pound of weight adds to gasoline consumption and maintenance.

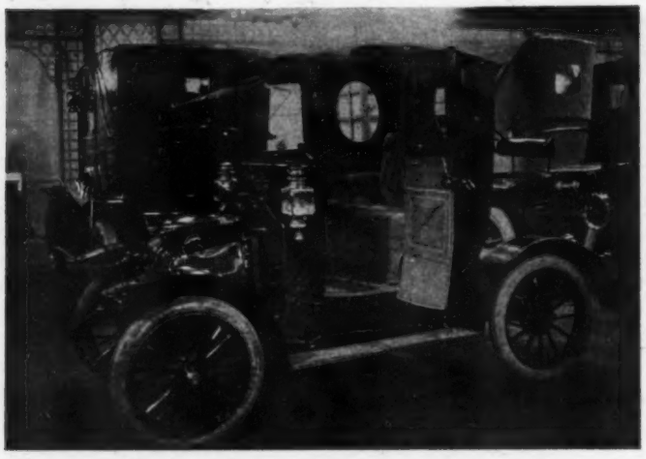
The third factor, ability to give continuous and efficient service. This is perhaps the most important feature to the buyer of a power wagon.

The Grabowsky offers continuous service because it is the only car whose entire power plant can be removed and another power plant inserted in the car, a one-man operation requiring hardly 15 minutes. By actual (not theoretical) standardization of parts, every power plant made by the Grabowsky Power Wagon Company fits every Grabowsky truck.

For the use of commercial vehicles, it is only necessary to have an extra power plant (at a small cost) and continuous service of this truck is practically guaranteed. As to power, it is only necessary to show that the Grabowsky is making good in Pittsburg, Cincinnati, the Rocky Mountains, the Allegheny Mountains, the Sierra Mountains (the hardest conditions under which cars can be used) to prove the power efficiency of the Grabowsky.



An Aisle in the Foreign Car Department Where the Importers Displayed Their Products Advantageously



Renault Inside Steering Coupe—A New Type

For these reasons and many others we recommend the Grabowsky as giving unequal satisfaction to prospective purchasers.

MARTIN: Publicity Department, Martin Carriage Company—Economy is the word that makes the Martin Commercial car the most desired.

The strength of a Martin car is economy in every sense of the word. A car that will stand up under its full loading capacity, and not show a sign of weakness, even when under its normal road speed, and equipped with an engine having power enough to run the car loaded to capacity at its normal road speed. A car that inexperienced men can handle with ease, constructed as near fool proof as possible, with gears that can be shifted in a second's time and with no danger to the mechanism.

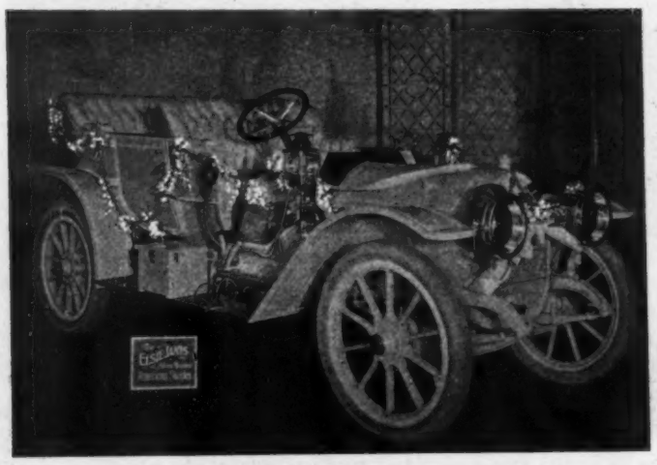
Martin motor cars can be run through congested streets on high gear, at a speed not to exceed 4 miles per hour.

The riding qualities of a Martin car excel all others, hence every part of the car has a protection not found in other cars.

A motor that has no bevel gears or third chain, not even a belt in its construction, is water cooled and equipped with a mechanical oiler, a simple direct drive.

The Martin car is designed and built by men who know the requirements of a delivery car—men of years of experience in this construction. We back up all this with twenty-five years of experience in vehicles and wagons for transportation purposes.

MIDLAND: E. W. Nicholson—The strong argument in favor of the Midland Model L is the up-to-date design and the careful attention to details in the construction of the Midland unit power plant and system of three-point suspension.



Elsie Janis' Handsome New American Simplex

On the Model L it is absolutely impossible that any of the strains caused by rough and unven roads shall be transmitted to the power plant. By this it is meant that the style of suspension is so flexible that there will be no strains applied to any part of the power plant construction.

This feature is a most decided advance in automobile construction and is being so thoroughly recognized by all who have examined the car it cannot help but prove interesting to the man looking for a car that will give satisfactory service for a long period of time.

A GERMAN ON THE AMERICAN INDUSTRY

Herr Wilhelm Opel, who has recently returned to Germany from a lengthy visit to the United States, has been interviewed by a leading Berlin daily paper as to his impressions. The following is culled from his verdict, which primarily led to a comparison of the state of affairs sixteen years ago, when the industrial development towered high over that of Germany and now, when, during his second stay, Commercial Councillor Opel finds that the Fatherland has caught up to the Republic and that there is no great difference in business organization here nor there. "Nothing," said Herr Opel, "could make me realize more fully the immense strides the German industry has taken than the absolute lack of any surprise during the eight weeks, in which I have inspected American factories, large and small. Over here the industry is on the same level as over there.

"Regarding the American workman as such, I may say he is a specialist as compared to ours, who, in a great many cases, is an all 'round man. But as specialization contains numerous advantages for the perfection of goods, we too are slowly nearing the American method of educating workingmen to this point. Over there this developed of itself, because the workingman himself pressed forward to this end, for, on the whole, he is more intelligent than ours, as a consequence of the racial mixture and the fresh infusion of blood attained thereby. On the other hand, this advantage is equaled by the better education given our working classes by compulsory schooling, as well as the evening classes which are partly obligatory, partly attended voluntarily.

"My chief automobilistic impressions concern the New York motor traffic. Horse-drawn cabs are hardly to be seen, and I venture to predict that in ten years' time horses will have completely vanished from the streets. One city corporation of New York is greatly interested in this problem and chiefly from an hygienic point of view, for the city is surrounded by water and suffers very much from swarms of flies, which naturally were encouraged by the horse, but now this plague is lessening. Motor traffic in the country is almost unknown, for what we would call roads are only met with for short distances; while we still use the highways that were built by the Romans in the middle ages or during the Napoleonic period, the railway was the open-up culture for America and towns and villages were built on either side.

Asked as to the output of the American factories, Herr Opel replied: "During the first days of my stay I was told of factories with an annual production of 12,000 cars. The closer I came to these factories, the more these proud figures dwindled. Every town I stopped at knocked off a thousand or so, till when I arrived at the place in question I learned that, all told, 4,000 would be the figure. There are two or three factories which turn out 8,000 to 10,000 vehicles a year.

"I cannot imagine that we may respect a mass importation of cheap American cars, they have never been able to get a good grip on our market. However, surprises are never excluded in business life. Should an over-production take place, which is not impossible within the next two or three years, the American market may seek to fall itself by force and throw its goods on Europe. But we need not dread this competition. The American car is built too lightly and not rigid enough for our roads."

· THE · A · M · C · M · A · SHOW ·

ON THE TREND OF THE AUTOMOBILE TRADE

By STEWART McDONALD, General Manager Moon Motor Car Company

FORECASTING has always been a very fascinating field for thought and those who are successful in wresting from the future her secrets are, other things being equal, generally the ones who achieve the greatest results in any line of business, for, as the old saying goes, "If our foresights were as good as our hindsights, we would all be successful."

The automobile is here to stay. There may be some differences of opinion as to the type of car, the particular price and size which will eventually fulfill the maximum requirements. There is also some difference of ideas as to the horsepower and motor sizes best adapted, but among any deep-thinking body of men it is bound to be unanimously admitted that the automobile as a necessity is permanent, and its sphere of action will be broadened and developed and the numbers in use multiplied exactly proportional to the quality of cars furnished, the general price, and the improvements in the roads and highways of this country.

The talk about the automobile industry being the natural heir to the calamities which befell the bicycle trade can carry but little weight when it is but once remembered that the bicycle, while it was a vehicle of transportation in a measure, was at its best but a species of gymnasium apparatus, eagerly sought for by the faddists, and as rapidly dropped when the craze lost its popularity.

From all this it is not to be argued that there may not be dark days, and many of them, in front of the automobile industry. However, these, if they come, will be the result of either the greed or the impetuosity of the manufacturers who are at present in the business, in their endeavor to expand their output in undue proportion to the natural market for cars.

What the exact effect even this will have upon the automobile industry, or more properly speaking, on the automobile as a whole, is still another problem and even more difficult to fathom. It would seem, though, that if such events came to pass, the natural result would be that the public, having a larger selection of wares to choose from, would buy with greater discrimination. Granting that the public does not long remain in the dark upon any one subject, it would appear that probably the identical manufacturers at whose doors could be laid the too large and too greedy growth would be the heavist sufferers themselves. Usually excessively rapid growth and thoroughness do not go hand in hand.

The trend of the automobile business is rapidly toward cheaper cars. This is as it should be, as the number of people who can afford a moderate-priced car is infinitely greater than the few who are ready purchasers of a high-priced automobile. It is only right that the greatest development which will probably take place in the next few years will be toward perfecting the car of medium price and bringing even this within more ready reach of the average buyer. A moment's reflection will readily convince the most skeptical of this.

Go away from the large cities, take the towns and villages and realize the enormous field in which the horse and buggy is still utilized. A good horse and buggy totals almost $500, to say nothing of what a fairly good team and surrey would come to. In any instance, one of the moderate-priced automobiles, even at the figures current to-day, would show a greater economy, greater mileage and greater service for a slight increase in the investment, with all the possibilities the future might bring in the way of reduced prices and more efficient service.

With the enormous increase in the use of automobiles is also coming a great development in the average user along mechanical lines. Business, office men and people who are never accustomed to handling anything more pretentious or complicated than a tack-hammer, display a truly intelligent knowledge of most mechanical principles. The intimate learning that even school boys have now, together with the original ideas, which in some instances they possess regarding the real intricacies, is marvelous and indicates that the day is fast approaching when even the boy will look upon the purchase, handling, and usage of an automobile with less forbearance than was shortly before felt by his friends who tackled the proposition with the services of an expert chauffeur.

Marvel has sometimes been expressed at the remarkable manner

In the Commercial Car Section the Display Was the Most Effective and Varied That Has Ever Been Presented

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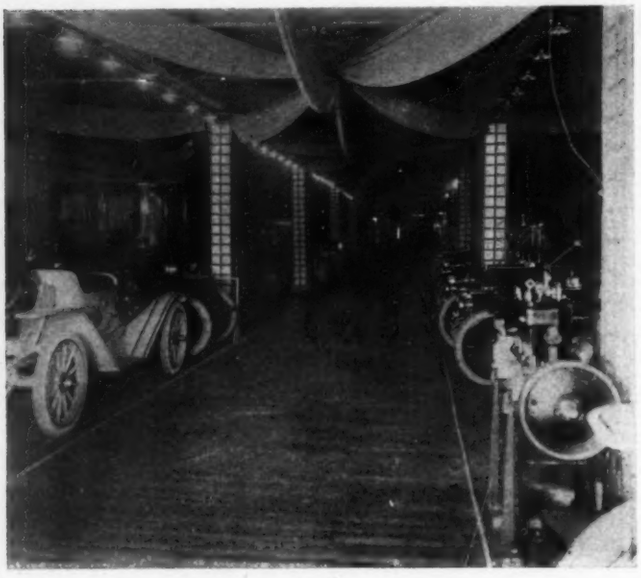
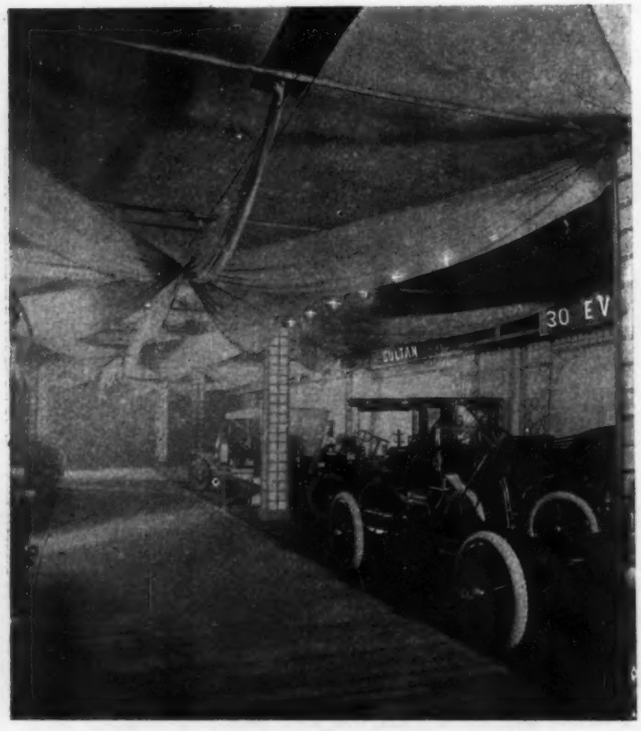


Looking North on an Aisle on the Second Floor

in which medium-priced cars have been absorbed in the good farming States—States where the average land-holder could well afford to be the purchaser of a medium-priced car. The possibilities here, large as they have been in the past, will greatly exceed this in future, as it is in these districts that the automobile comes in for its fullest measure of utility. The automobile is a pleasure vehicle always, and one that does not weary with miles—a device that places the farm within almost neighborly distance of the city—the means of quick communication with stores, shops, doctor, or emergency repairs, and, above all, something, which added to country life, gives it all the conveniences of the city with the charms retained.



Another Section of Second Floor Looking Eastward

Coupled with this has been the natural way in which they "catch on" to cars in the country districts. It has often been wondered why it was that a shipment of 50 cars to a small town where they are distributed to the people living in the vicinity is heard from in the way of repairs so much less frequently than the same number shipped to a large city agent.

The reason is simply that the people living in the country have been accustomed to machinery for a long time—hardly one of fifty owners has not an anvil on his own place. These can make a weld as well as the average journeyman blacksmith. Furthermore, they are more patient and used to thoroughly looking into their various machines and learning the principles thereof and so they naturally take the same pains with their automobiles. Hence, in a very short time, they become as proficient in their adjustments and handling as is the dealer who sold them the car.

The trend, then, of automobiles, as the writer sees it, is toward more and better cars. Probably lighter cars with simplifications in the mechanism taking place as rapidly as developed is a factor which lessens buyer resistance. These all would have a tendency toward a reduction in price, especially as standardization sets in and changes become less frequent.

The development of good roads will greatly increase the use of cars, especially in States where the trade is somewhat backward. However, the greatest development will be the acquisition of a complete knowledge, acquaintanceship and understanding of the underlying mechanical principles. It is not enough then, therefore, for a manufacturer to see that his employees—his agents, salesmen, etc.—are thoroughly familiar with the constructive theory and features, but the real and prospective purchaser, the public at large, should also acquire a thorough familiarity and understanding of the mechanical principles underlying automobile construction.

This, coupled with a healthy growth in the manufacturing end of the business and a steady development of good roads, will take care of the future of the automobile industry.

CHAIRMAN FOR BALTIMORE SHOW

BALTIMORE, Jan. 3—President C. Howard Millikin, of the Automobile Club of Maryland, will be chairman of the committee which will have charge of the next annual show to be held under the club's auspices, February 22 to 26, inclusive, at the Fifth Regiment Armory. Dr. Millikin has appointed as other members of the committee, Thomas B. Hutchinson, assistant chairman and also assistant secretary of the club; Dr. H. M. Rowe, H. M. Luziers, Thomas G. Young and Joel Nassauer. Dealers who desire information regarding the show will be accommodated by President Millikin, 914-916 Equitable Building or Assistant Chairman Hutchinson at the clubrooms, The Garage Building, Mt. Royal avenue and Charles street. Aeroplanes and balloons will be among the new features of the approaching exhibition.

Floor space has already been partitioned off and drawings for the desirable places will be made by the dealers within a week or so. All spaces, with the exception of a few in the middle, will be sold at the same price. Representatives of the show committee have been attending the shows already held and will be present at others to be held with the view of suggesting the latest features for the Baltimore exhibit. The club members held a stag progressive euchre party at the club rooms last Tuesday evening.

CINCINNATI SHOW FOLLOWS CHICAGO'S

CINCINNATI, Jan. 3—The Automobile Club of Cincinnati will hold its show in the Music Hall, February 21 to 26 inclusive. This is the first time that the club has promoted a show. Although applications for space do not close till December 31, more than half of the space had been taken and deposits paid by the middle of the month. Rutherford H. Cox is general manager.

THINGS THAT ATTRACT IN THE ACCESSORY FIELD

"WATCHMAN, what of the night?" Automobiles by dominance of size and space occupied claim first attention of visitors to the Show. Primarily, they overshadow other exhibits, unduly draw attention, and rob half the accessory subject of its potency as an attraction. In the meantime, when truth is dragged from its lair, and photophobia is thrust behind, spectators may be awakened from their lethargy, and the news may be gently broken: There is not, in all the land, an automobile made in which accessories do not enter.

Some automobile makers claim the distinction of producing 93 per cent. of all that goes into their wares; more hold that they produce all but lamps, tires, radiators, tools, wheels, rims, drop forgings, bodies, windshields, tops, cylinder castings, crankcases, gearcases, crankshafts, etc. These say they build the car complete.

Consistency is the jewel which shines for all but the man who wants to take unto himself credit for having thought out the scheme of the Universe before God wrought parts, put them together, and thrust them out, into the swirl of gravitational influence, branding the whole flock as "accessories."

When the A. M. C. M. A. show opened at the Palace on New Year's eve, the accessory division may have been a little less spectacular, thrust in corners to some extent, and less of interest to the casual observer, but the cars, as they were to be seen, taking them as a whole, were as good as the foundation on which they rested, and it is to the credit of accessory makers, to a very considerable extent, that they bask in the sunlight of favor, and reflect credit upon their sponsors.

The accessory division is a big limb of the tree, even though some would have us believe that it is no more than a twig. Accessory makers are bent upon compounding a permanent reputation for themselves, and they fully realize that, to be successful, it is necessary for them to engrave their crest high up on the face of a granite cliff, rather than in the sands of the shore. Having forged from the solid bar, so to speak, taking pains to apply the "sand blast" of experience and honest endeavor in the process, the accessory makers lighted their lamps of wisdom, wave to magnetos, coils and batteries, their allotted work, lubricated the ways for business, sounded horns, while tires were there in profusion, vying with shock absorbers.

From the Palace to the Garden, will be the move, and when the A. L. A. M. opens on January 8, for a week, it will be with all the Palace accessory exhibitors attending, and many more besides. Never before, in the history of the automobile, has there been such a display of accessories, or such a widely diversified panorama of the 895 different kinds of parts which constitute a full-fledged automobile. Again, it is not a far stretch of the imagination to proclaim that quality presides, good taste sits at the right hand, and catchpenny knick knacks, of which a flock once perched among us, have taken wings as timid birds, lacking in down and feathers.

GENERAL REVIEW OF ACCESSORY EXHIBITIONS

In reviewing accessory exhibitions, it has ever been difficult to arrive at a basis which would afford satisfaction from all angles. One way is to briefly mention each stand, state what it holds by way of a leader, and leaving a good taste in the mouth of the advertiser, at the same time, avoid offense to the sensibilities of the readers. In order to realize the difficulties involved, it is only necessary to state:

Taking the accessory exhibitions at the Palace alone, assuming that there are 238 separate subjects to cover, and allowing that each subject be dismissed with 200 words, it would require just under 50,000 words to cover the exhibits, and as will be readily appreciated, not a single one of the exhibitions would be intelligently discussed, for the reason that, in 200 words, it is not possible to say anything on a basis of introduction, construction and conclusions. It follows, then, that without telling what a thing is for, how it is made, and how well it performs, it is useless to broach the subject at all, much less to dribble out 50,000 words in nauseating puffs, thus destroying the value of the paper, killing the usefulness of the writer, and rendering the audience immune from future attacks, either with truth, truckle, or trend.

RESUME OF THE ACCESSORY INDUSTRY

A comprehensive résumé of the accessory industry, better than a sea of meaningless mentions, will leave the subject in a healthy state, and in the time to come, it will be possible to systematically sort out the accessory features, and by properly spacing them, and using comprehensive illustrations to make good reading for maker and user alike, reflecting credit upon the paper which undertakes the task.

For the time, then, we present the resumé, taking the subjects in rundown order. There is no order of importance on the count that "every link is necessary in a perfect chain."

BODIES, TOPS AND WINDSHIELDS

Comfort in winter automobiling depends in no small measure on the equipment of top and windshield, providing of course that the open touring car is used all the year round. The supply of windshields shown at the Palace is particularly extensive, and indicates a very strong demand for this accessory. It is worthy of note that the old style single-piece shield has practically disappeared; even the cheapest models are hinged in the center. No one who has had experience with the old type will regret its passing.

One concern shows a new shield of this variety at a very reasonable price, in which the glass frames are of wood. This finish is preferred by many people, and is in keeping with the tendency to eliminate brass work as much as possible. The majority of shields, however, are made with brass frames; in many cases these are made very narrow.

These is really no reason why a glass shield should be surrounded with a heavy metal border. Glass is one of the most elastic substances known, and is much harder to break than people generally suppose. Indeed, it is less liable to breakage when unsupported than when held rigidly by heavy metal-work. One shield at least seemed to be built with reliance on this idea, although two other companies also offered exceptionally light and neat constructions.

Means employed for holding the folding glasses in place are almost innumerable, and seem to work on nearly every principle of mechanics. Automatic devices naturally predominate, with many varieties of spring-tension and thumb-screw arrangements. An increasing number are what is called automatic—that is, they can be moved into any desired position merely by pushing or pulling with a single hand, and when set will retain their position. This feature is accomplished usually by a constant-tension spring device.

Another feature which is becoming more prominent is the adoption of eccentrically folding upper glasses, instead of plain hinged ones. This allows the shield to be set with the parts separated, leaving an open strip through which the driver can see the road perfectly even when the rest of the shield is spattered with rain. At the same time the protection is but slightly impaired.

One company has a model especially adapted for runabouts in which the lower glass is slanted back at a considerable angle. Many modern cars have so much room between the front seat and the dash that a straight vertical shield over the latter gives but little protection. This idea of course brings the vertical upper section back into a more useful position.

Tops are shown by two companies, and another has on exhibition a line of its fabrics for tops, which have found general use. Monograms and door-plates are also shown. For body finishing there are varnishes made by two reliable firms. Most of the

body builders proper have migrated into the complete car section, by taking the agency for some car which they can fit with their bodies. This tendency is particularly noticeable in the importers' section, as many of those exhibiting there have graduated from the accessory class. The complete list of those exhibiting at the Palace follows:

L. C. Chase & Company, Boston.
Hill Mfg. Co., Buffalo, N. Y.
Ideal Wind Shield Company, New York City.
Metal Stamping Company, New York City.
Moller & Schumann Company, Brooklyn, N. Y.
Pantasote Company, New York City.
W. F. Polson, Buffalo, N. Y.
John A. Salman, Boston, Mass.
Sprague Umbrella Company, Norwalk, O.
Troy Carriage Sun Shade Company, Troy, O.
Valentine & Company, New York City.
Vehicle Apron & Hood Company, Columbus, O.

The following will exhibit at the Garden show only:

Cowles & Co., New Haven, Conn.
Cox Brass Mfg. Co., New York City.
Hayes Mfg. Co., Detroit, Mich.
C. A. Mezger, New York City.
L. J. Mutty Co., Boston, Mass.
National Auto Top Co., New York City.
Novelty Mfg. Co., Waterbury, Conn.
Rands Mfg. Co., Detroit, Mich.
Springfield Metal Body Co., Springfield, Mass.
Vanguard Mfg. Co., Joliet, Ill.

PROFUSION OF HORNS AND SPEEDOMETERS

Automobile horns may be divided into three classes; those of the familiar type operated by air pressure from a bulb, those connected with the exhaust of the engine, and those operated electrically. The "old reliable" type is shown in a multiplicity of forms by one company, including the design with a knob punched full of holes in place of the bell.

Exhaust operated types are shown by two concerns. One outfit is extremely reasonable in price, and has what is described by the maker as a "chromatic scale of bird-like notes." The other company's devices are more pretentious, being made to sound a chord of three notes. The most recent production is the "trumpet," which can be made to sound the army bugle calls. It has four separate tubes, each giving a different note, and controlled from a keyboard. As a warning, all four can be sounded together.

Most modern of all are the electric horns. The latter is one of the most original and efficient devices for converting energy into sound ever invented. It contains a small electric motor with a toothed wheel on an extension of its shaft. The teeth strike against a hardened steel button on a steel diaphragm, causing the latter to vibrate sharply. The process is compared, with reason, to snapping the bottom of a tin can. The diabolical racket that results when the current is full on can be heard a mile, and is guaranteed to produce results.

The other, although likewise electric, does not depart so widely from the ordinary. In this case the motor drives a turbine fan, and the sound is produced by an air blast. A feature is the ingenious magnetic brake, which brings the revolving part immediately to rest when the current is turned off.

Speedometers offer one of the widest fields for the exercise of mechanical ingenuity. Among those exhibited there are three actuated by centrifugal force, one by air pressure, one by liquid pressure, and one by magnetism. One other exhibit seems to elude all classification. This latter, a new device, resembles a clock mechanism, and indicates only the average speed for each thirtieth of a mile, making no record of momentary variations. One great advantage of this construction is that the fastest moving part revolves only 30 times to each mile. Naturally there is no perceptible amount of wear in the parts.

The centrifugal instruments, although working on the same principle, differ in many details. Each has some distinguishing feature of merit. One company, as usual, features the "steady hand," and the exhibit includes a device for shaking and jolting one of the instruments to exhibit this feature.

Another retains the familiar magnetic action, and a third the tube full of red liquid and the centrifugal pump to drive it up along the indicating scale. One company has a new idea, in which the instrument is worked by air pressure. No details of the construction are available, but it is interesting simply as another example of the ingenuity which is expended in this branch of the automobile industry. Those who exhibit horns are:

Automobile Supply Mfg. Co., Brooklyn, N. Y.
Gabriel Horn Mfg. Co., Cleveland.
Lovell-McConnell Company, Newark, N. J. ffl
Nightingale Whistle Mfg. Co., New York City.
Nonpariel Horn Mfg. Co., Brooklyn, N. Y.
Sireno Company, New York City.

The speedometer makers are:

Auto Improvement Company, New York City.
Cleveland Speed Indicator Company, Cleveland.
Hoffecker Company, Boston.
Shipman Instrument Company, Sunbury, Pa.
Star Speedometer Company, Danville, Pa.
Stewart & Clark Mfg. Co., Chicago.
Troy Carriage Sun Shade Company, Troy, O.
Veeder Mfg. Co., Hartford, Conn.
Warner Instrument Company, Beloit, Wis.

The following will exhibit at the Garden show only:

Jones Speedometer Co., New Rochelle, N. Y.
Recometre Co., New York City. ffl
Riley-Klotz Mfg. Co., Newark, N. J.

GREAT VARIETY OF LAMPS EXTANT

Two noteworthy tendencies may be observed among the exhibitors of automobile lamps, namely, the growing popularity of electrics and the great number of devices to reduce the "glare" or partially eclipse the lamp for city driving. There can be no doubt that the electric lamp is the lamp of the future. Its simplicity of operation and reliability would alone suffice to give it the preference; add to this an economy of operation far surpassing the gas and oil forms, and its triumph is sure. Practically every maker of gas and oil lamps showed electric models, sometimes adapted for electricity alone, sometimes arranged for combinations.

One well-established company showed an electric headlight of very simple and pleasing design, the body of the lamp being a single bowl-shaped piece of drawn metal, without projections except the bracket lugs. One of the latest styles of gas lights is called the "close-coupled," a rather short lamp of large diameter, which should give a pleasing effect in connection with modern body work. Another new idea is a fixture for a gas headlight to hold an electric bulb. The bulb may be swung into focus whenever desired, as for city driving, or may be swung out of the way, without disturbing connections, so as to allow the use of the gas jet. Two other companies also showed electric headlights.

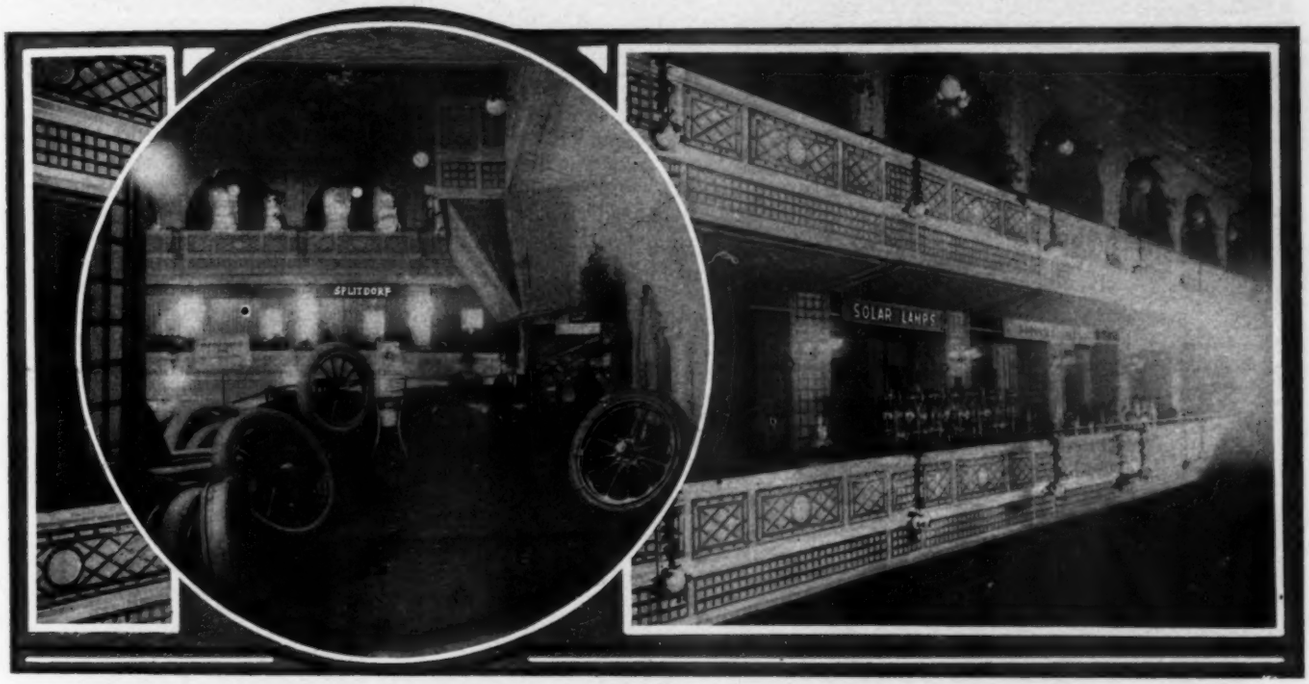
Practically all the new oil side and tail lamps are arranged for the use of electricity if desired. Two makers have an electric fixture which replaces the oil front, and a third has the bulb permanently in place beside the oil flame. This exhibit also includes a good-looking side lamp for closed cars, in the shape of a cylinder set vertically, and a combination electric tail light and number-plate holder, so arranged that the latter is always illuminated to comply with State laws. One shows a combination oil and electric side lamp, but does not feature it so extensively.

Many devices have been brought out to reduce the objectionable glare of the ordinary acetylene headlight. These take the form either of obstructing partly the light, or of diffusing it in better ways. The latter construction is exemplified by a lamp with a front door which consists of a number of lens strips, the front sides of which are ground to a convex curvature. These have the effect of spreading the light out horiontally rather than vertically; when the beam from the lamp is cast on a wall the illuminated area takes the shape of a flat ellipse with the longer axis horizontal. With the lamps in their ordinary position on the car the light from them is kept below the level of a pedestrian's eyes. The only change from the ordinary acetylene lamp

is in the door, and the new doors with the lens strips can be obtained separately and put on old lamps.

A very neat eclipsing device has been brought out, which consists merely of a metal disc on the end of a pivoted arm. These are controlled from the driver's seat by Bowden wires, so that when desired the discs may be swung down into the center of the lamp, thus cutting off the strongest portion of the beam. It is noteworthy that the disc swings down behind the jet, not in front of it, as might be supposed. When the disc is down, one looking into the lamp sees only the acetylene flame against a black background, with no more dazzling effect than an ordinary gas jet.

The reaction against excess brass work has been the occasion of the bringing out of a very pleasing new finish. This is known as the "patent leather" finish, giving a metallic lacquer-like lustre, impervious to heat and moisture. It does not need to be polished and requires no especial care in washing to prevent scratching. Several combinations are made; one all black, one



Two Views of Accessory Exhibits in the Balcony, Set Among Original and Artistic Decorations

a black body with the front door rim left in brass, and another black with nickel trimming. The innovation seems deserving of great popularity. The exhibitors of lamps are:

Atwood-Castle Company, Amesbury, Mass.
Badger Brass Mfg. Co., Kenosha, Wis.
R. E. Dietz & Company, New York City.
Edmunds & Jones, Detroit.
Gray & Davis, Amesbury, Mass.
C. M. Hall Lamp Company, Detroit.
Manhattan Screw & Stamping Works, New York City.
Rushmore Dynamo Works, Plainfield, N. J.

The following will exhibit at the Garden show only:

Apple Electric Co., Dayton, O.
English & Mersick Co., New Haven, Conn.
C. T. Ham Mfg. Co., Rochester, N. Y.

TIRES, RIMS, AND ACCESSORIES FOR THEIR CARE

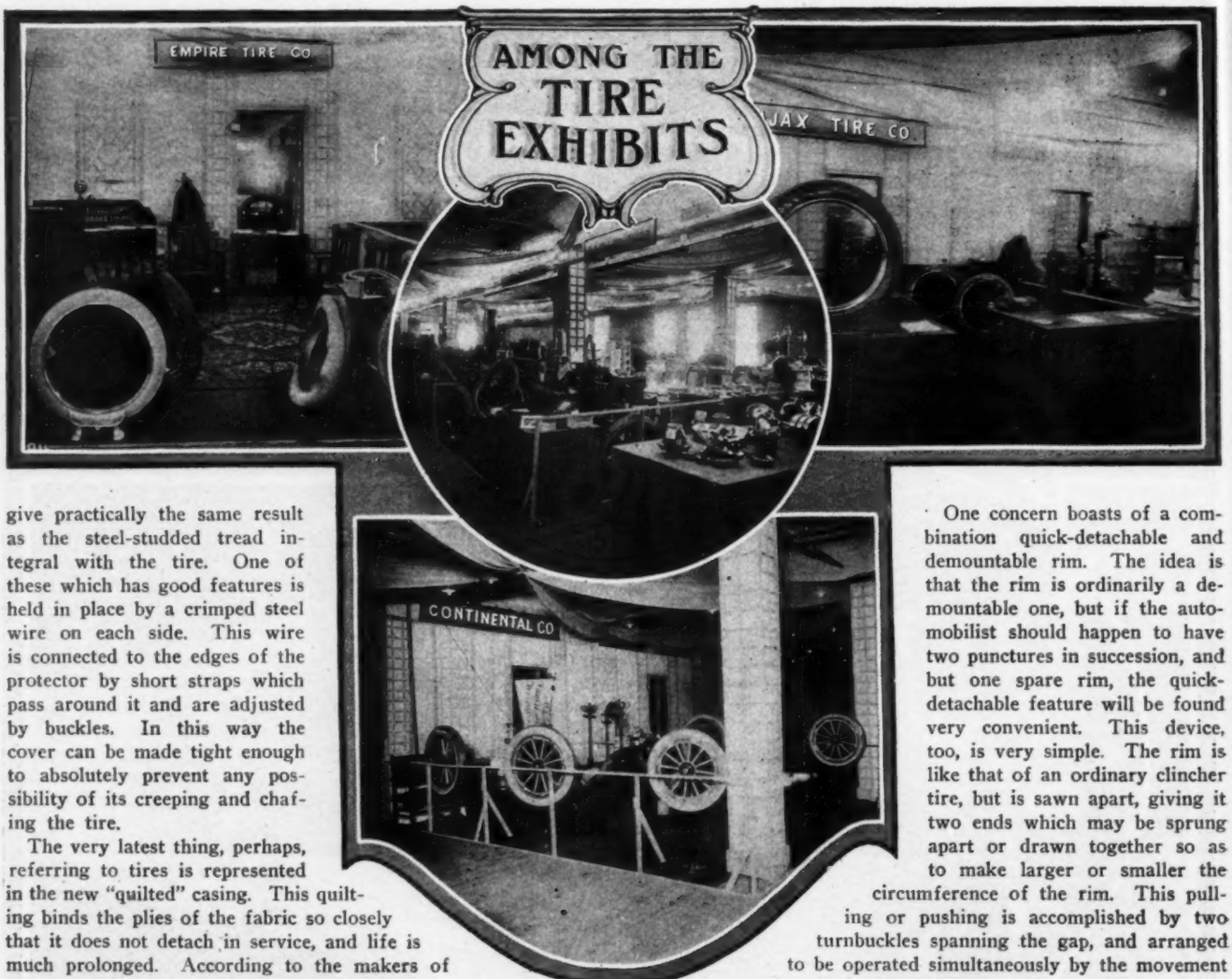
Winter is the open season for non-skid treads, and most of the exhibitors at the show featured this side of their line. The most popular idea seems to be raised projections molded in the rubber tread. These take many forms. Most of the standard makes are furnished with a well-known tread of regularly spaced studs, which has been in satisfactory use for several years. Others have adopted different ideas. One manufacturer has his name molded into the tread in sharp-cornered letters, which are said to be of peculiar efficacy in holding the wheel to the road.

Still another idea is to thicken the whole tread a quarter of an inch, and then mold diagonal grooves in two directions, crossing each other, through the body of this additional rubber. This had the effect of greatly increasing the thickness of the tread, and by consequence its wearing and puncture-resisting qualities. The deep corrugations still leave, however, a large range of flexibility, and so the resilience is not seriously impaired.

Steel-studded treads are also seen in many stands, and the general impression seems to be that they can cope with situations too serious even for the raised rubber tread. The unsatisfactory features developed by these tires in early days have been overcome by modern machinery and methods. They have usually leather protecting bands to hold in place the steel rivets. This leather is specially treated so that it will not lose its flexibility in service; it will neither become soft and spongy nor hard and brittle. The steel studs are turned from soft metal and then chilled by a special process, making them practically glass-hard; in this condition even road grit and sand have but little wearing effect on them. The inside of the rivets still remain soft, so that they will not break off.

Makers of detachable anti-skid devices are also present in full force. There are tire chains of every imaginable shape and arrangement. One make has a band of rubber under each cross chain, thus not only protecting the tire shoe from the abrasion of the chain, but also covering a space on each side of the chain and protecting the tire from wear and puncture. In this type the cross chains are about five inches apart. The side chains to which they are attached are flexible and so lie flat against the side of the tire. The side chains have rings on each end, which are connected by a one-inch chrome leather strap. These have buckles, by means of which the chains can be drawn up tight. The ends of the straps are then passed around one of the spokes and made fast, thus preventing the chains from creeping.

It is also possible to secure steel-studded leather covers for the entire tire, which may be applied or removed at pleasure and



give practically the same result as the steel-studded tread integral with the tire. One of these which has good features is held in place by a crimped steel wire on each side. This wire is connected to the edges of the protector by short straps which pass around it and are adjusted by buckles. In this way the cover can be made tight enough to absolutely prevent any possibility of its creeping and chafing the tire.

The very latest thing, perhaps, referring to tires is represented in the new "quilted" casing. This quilting binds the plies of the fabric so closely that it does not detach in service, and life is much prolonged. According to the makers of this new tire, 10,000 miles represents a normal expectation, the increase in distance being brought about by the influence which the stitching has in that it limits fabric trouble and isolates the ills of road inequalities, permitting surface repairs at leisure and aborting blowouts.

Many improvements have been made in the construction of inner tubes, and as a result of this one maker has found it practicable to guarantee his tubes for one year's service. The claims made for the tube proved justified, and no demand was made for replacements under the guarantee. All the tubes returned had been injured by punctures, pinching and other mishaps in no way the fault of the manufacturer or of the tube. The policy has been so successful that it will be continued for another year. The features of construction to which this success is said to be due are enumerated as the use of the best Para rubber, specially compounded; careful cutting of the material, and the making of the valve patch integral and careful curing at the right pressure and temperature.

Demountable rims are proving a fruitful source of inventive activity. There are several at the show that have never been exhibited before, and whatever may be their merits as rims, one and all are the product of remarkable ingenuity. In one of these all the mechanism is confined to a single bolt, which is turned on or off to loosen or tighten up the rim. This makes it impossible to put the tire on in the wrong position. This is accomplished by a worm device actuating a double turnbuckle.

One concern boasts of a combination quick-detachable and demountable rim. The idea is that the rim is ordinarily a demountable one, but if the automobilist should happen to have two punctures in succession, and but one spare rim, the quick-detachable feature will be found very convenient. This device, too, is very simple. The rim is like that of an ordinary clincher tire, but is sawn apart, giving it two ends which may be sprung apart or drawn together so as to make larger or smaller the circumference of the rim. This pulling or pushing is accomplished by two turnbuckles spanning the gap, and arranged to be operated simultaneously by the movement of a single detachable key, which is the only tool required. To put on the tire and rim the latter is expanded until it is large enough to slip easily over the felloe, and then contracted until it is clamped tightly in place. The reverse process accomplishes the removal. To remove the tire from the rim the latter may be contracted still further; this loosens the steel tire retaining ring and allows the tire to be slipped off as on any quick-detachable.

Another rim which is new at the shows looks like a further development of a well-known make of tire. The rim is held to the felloe by six through bolts. The advantages of this type are the absence of narrow wedge-shaped parts, which are always liable to rust and stick.

Cushion tires are seen in at least two forms, both of which seem to have given good satisfaction in the hands of users. One of these resembles a pneumatic tire in every respect except that instead of an inner tube it is provided with blocks of soft rubber inside. A heavy annular rib of fabric runs around the tread of the tire and equalizes the support received from the rubber blocks, so that the tire is of equal stiffness at all points, whether directly over a block or between them. The blocks are of course proportioned to suit the weight of the car they are expected to carry. The tire is built over a steel form or core and is cured or vulcanized in one operation, so that there is no danger of the blocks separating from the solid wall. This tire is claimed to ride as easily as a pneumatic.

For commercial vehicles one of the most interesting forms is a sectional block tire brought out by a well-known manufacturer of carriage tires who has recently invaded the automobile field. These tires are made up of as many as thirty or forty blocks, square in shape but with beads around the base. These are held in place by a metal frame with square holes through which the blocks project. The frame clamps down on the beads at the bottoms of the blocks. The shape of the tire precludes skidding and gives the maximum resilience possible with a solid tire. These tires are made up to eight-inch dual treads, 48 inches in diameter, suitable for trucks carrying ten tons load.

A very recent development of note in the tire industry is the effort of a German maker who has never before attempted to export to this country. This is distinctively a high-priced tire, and makes no pretension of competing in price with other brands. This is said not to be due to the duty alone, but to the fact that the tire sells for more in Europe than other tires made abroad and competing with it. Like some American tires, it is guaranteed for 5,000 miles' service.

Aeronauts, present and prospective, will be interested to learn that at least one American tire maker is prepared to meet their requirements. Three styles have been brought out, made in a variety of sizes, and in their construction care has been taken to secure the maximum resiliency and at the same time great strength.

For electric vehicles a special tire has been brought out which is claimed to give a much greater mileage on the same battery charge than was obtainable with solid tires. It is a double-tube, with all the flexibility and buoyancy of a single-tube and the strength of a solid. This tire was used on one electric that set a high-water mark of 150 miles on a charge.

Tire accessories are usually of as great interest as the tires themselves, and their efficiency or lack of it often makes or mars the pleasure of a trip. No feature of tire operation is as

important as the maintenance of the proper air pressure. One tire maker has brought out a gauge which will instantly register the pressure by merely pressing it over the valve. It is a small and handy device, easily carried in the pocket. A pin in the socket of the instrument forces the valve plunger down when it is applied, admitting the air pressure to the body of the gauge and the pressure is instantly registered on a scale.

To obviate the labor of pumping up the tires, once it is known that they are deficient in pressure, there are innumerable forms of engine-driven pumps and cylinder taps, but one of the neatest devices is that air tank brought out by one manufacturer during the last Glidden tour. This is simply a substantial tank filled with compressed air and provided with a suitable reducing valve, a pressure gauge and a length of hose to make the connection. It can be refilled any number of times, and each filling is sufficient to inflate fully from seven to thirty-five tires, according to their size. Empty bottles are exchanged on the same plan universally used for gas tanks.

The following makers of tires and the accessories involved in their operation are exhibited at the A. M. C. M. A. show:

Ajax-Grieb Rubber Co., New York City.
American Stepney Spare Wheel Co., New York City.
Atlas Rubber Co., Batavia, N. Y.
Batavia Rubber Co., Batavia, N. Y.
Burroughs Remountable Rim Co., New York City.
Calmon Pneumatic Tire Co., New York City.
Consolidated Rubber Tire Co., New York City.
Continental Caoutchouc Co., New York City.
Dayton Rubber Mfg. Co., Dayton, O.
Diamond Rubber Co., Akron, O.
Empire Tire Co., Trenton, N. J.
Firestone Tire & Rubber Co., Akron, O.
Fisk Rubber Co., Chicopee Falls, Mass.
J. L. Gibney & Bro., Philadelphia, Pa.
B. F. Goodrich Co., Akron, O.
Goodyear Tire & Rubber Co., Akron, O.
G. & J. Tire Co., Indianapolis, Ind.
Hartford Rubber Works Co., Hartford, Conn.
Howard Demountable Rim Co., Trenton, N. J.
Leather Tire Goods Co., Niagara Falls, N. Y.
Michelin Tire Co., Milltown, N. J.
Morgan & Wright, Detroit, Mich.
Newmastic Tire Co., New York City.
Pennsylvania Rubber Co., Jeannette, Pa.
Republic Rubber Co., Youngstown, O.
Rutherford Rubber Co., Rutherford, N. J.
C. A. Shaler & Co., Waupun, Wis.
Standard Leather Washer Co., Newark, N. J.
Stevens Co., New York City.
Swinehart Clincher Tire & Rubber Co., Akron, O.
P. C. Traver Mfg. Co., Far Rockaway, N. Y.
Victor Tire Traction Co., Boston, Mass.
Zeglen Tire Co., Chicago, Ill.

The following will exhibit at the Garden show only:

Continental Rubber Co., New York City.
Favary Tire & Cushion Co., New York City.
Federal Rubber Co., Milwaukee, Wis.
Fox Metallic Tire Belt Co., New York City.
Hopewell Bros., Cambridge, Mass.
McGraw Tire & Rubber Co., New York City.
Motz Tire & Rubber Co., New York City.
N. J. Car Spring & Rubber Co., Newark, N. J.
J. H. Sager & Co., Rochester, N. Y.
Seamless Rubber Co., New York City.
Stein Double Cushion Co., New York City.
Voorhees Rubber Mfg. Co., New York City.

SYSTEMS OF TRANSMISSIONS WELL DEFINED

The production of transmissions seems to be to a very considerable extent in the hands of parts makers, and in a general way they may be classified as follows:

(A) Side chain drives.
(B) Selective, three speed.
(C) Selective, four speed.
(C) Selective, two speed.
(D) Progressive, three speed.
(E) Progressive, four speed.
(F) Semi-selective systems.
(G) Planetary systems.

Direct on high gear is the rule, this being true in the examples of planetary as well as when sliding gear systems are employed. If side chain drives are used with direct on high gear systems the reduction from the motor speed to that of the driving (road) wheels, initially, is made by establishing a lesser number of teeth on the different sprockets than on the rear wheel sprockets, and the improvement of the year lies in the use of driving sprocket wheels (pinions) with more teeth than formerly. It is now considered poor practice to have less than 14 teeth in the driving sprocket pinion, and in every possible case 18 teeth are used as a minimum. Contrary to the belief of some, side chain drives are more numerous than ever before, a great array of light runabouts using this class of drive, while trucks as employed in commercial pursuits are almost invariably of the side chain drive genera. Where once there were a few hundred high-priced touring cars built with chain drives, there are now thousands of runabouts that use them. When the writer went through the plant of the Diamond Chain Company, at Indianapolis, a few weeks ago, he expected to see far less than he found; instead of business falling off, due to encroachment of shaft drives, the reverse was indicated in many ways. The plant was full of work, additions in machinery were being made, rearrangement was going on, and an examination of the class of work being done, proved that it was for almost exclusively automobile makers. Reports from the other chain makers are on a level with the conditions as they obtain at Indianapolis, and a conservative statement of fact is that the chain situation is on a better basis than it was when shaft drives were the exception. The following chain makers have exhibits at the Palace and the Garden:

Baldwin Chain Manufacturing Company, Worcester, Mass.
Diamond Chain Company, Indianapolis, Ind.
Whitney Manufacturing Company, Hartford, Conn.

Will be at the Garden only:

Link-Belt Company.

BALL, ROLLER AND PLAIN BEARINGS

"Money talks" in the world of trade, so it is said. In the automobiles of the year, likewise, facts are stuborn things. Ball, roller, and plain bearings are used; none are excluded on the ground of lack of competence, and preference is given, in each instance, with reference to adaptability. It is this adaptability, then, that is uppermost, everywhere, and the specifications, as they would read for some cars, may be given as follows:

(A) Annular types of ball bearings for crankshafts and transmission gears.

(B) Tapered roller bearings for front and rear axles.

In a number of other instances the specifications would read:

(A) Plain bearings for motors, including crankshafts, camshafts, connecting rods, gear-spindles, etc.

(B) Annular types of ball bearings in the transmission gear, tapered roller bearings in road wheels, and Hyatt flexible roller bearings in the tubes, as in the live rear axles.

As a further example of present-day practice, there is the class of cars in which some one type of bearing is used exclusively, as:

(A) Annular types of ball bearings in the crankshaft, camshaft, clutch, transmission, propeller shaft, live rear axle, front axle, steering gear, magneto and ball-thrust bearings where thrust must be resisted.

(B) Plain bearings for the crankshaft, camshaft, accessories, clutch, and starting crank; Timken roller bearings in the transmission gear, propeller shaft, live rear axle, all road wheels, steering gear and knuckle.

(C) Plain bearings in the motor; Hyatt roller bearings in the transmission gear, live rear axle, all road wheels, steering gear and other places.

The tabular story of the automobiles shows a wide range of selection, and, with these facts to be encountered, there remains but the principles of application to be exploited. In the early days of bearings, especially of the anti-friction types, they were regarded of such great competence that, for a given load, the sizes selected were relatively small. The original premests was on a good foundation, and the bearings were of great com-

petence, but there are now two points to be taken into account in the selection of bearings:

(A) Static ability, referring to the ability of the bearings to sustain a quiescent load.

(B) Kinetic ability, which has to do with the life of the materials entering into the bearings, when subjected to shock, vibration, and alternating diagonal stresses.

In the earlier selections, in view of lack of experience from the point of view of kinetic ability, the bearings were large in relation to static conditions, but for kinetic service they frequently fell short of the requirement, and, while many of the applications were perfectly satisfactory, it remains that failure perched on effort with too frequent interval. Bearings, of the anti-friction types, under such conditions, fell into disrepute.

Most of the failures were in bicycle days, and when the automobile was in swaddling clothes. The introduction of annular

Tires and Other Accessories Exhibited in the Balcony Were Many and Well Placed.

types of ball bearings, under most careful conditions of selection, marked the turning point, and, by the proper use of appropriate materials, much headway was made in a few short years, and anti-friction bearings solved the problems of the day, among which, lubrication was not one of the least.

There seems to be no limit to the uses to which anti-friction bearings may be put, nor has any one type a monopoly of the good points. What the year's output seems to show is, that every application, no matter what the type the bearing may be, is a success when the bearings selected are large enough to do the work. The applications, being successful, as has been proved, rather go to show that the sizes adopted, for the respective kinds, are adequate.

STANDARDIZATION OF SIZES ALMOST COMPLETED

In the early days, when bearings were largely experimental, there were so many sizes, and such wide deviations in practices, that even the most experienced engineers were frequently in trouble, because of a mal-selection of a bearing. With no previous history, little information, and always the optimism of the makers and selling representatives, it was the easiest thing in the world to make a mal-selection.

This question of standarization is probably the most important step of all. It counts in more ways than were formerly recognized. Every maker, before agreeing to a standard, is bound to make sure that the standard fits the bearings in question. When ball and roller bearing makers, in America, adopted sizes such as were in common use abroad, they surely went to the pains to have the bearings so made, and of such good materials, that they would project favorable history for their sponsors.

One of the best practices of the present day is that of the makers of ball bearings who ascertain, by personal observation, if the bearings selected for cars are in keeping with the conservative ratings given, and, of the reputable makers of anti-friction bearings, none will fill orders if they discover that the uses to which the bearings are to be put, fall short of the practice established as safe. The makers of bearings which exhibited at the Palace were:

American Ball Bearing Company, Cleveland, Ohio.
Hess-Bright Manufacturing Company, Philadelphia, Pa.
International Engineering Company, New York City.
R. I. V. Company, New York City.
Standard Roller Bearing Company, Philadelphia, Pa.
Timken Roller Bearing Company, Canton, Ohio.

The makers of bearings which will exhibit at the Garden will be the same as at the Palace.

LUBRICANTS—FLUID AND NON-FLUID OILS

Oils and greases for automobile use are shown in great variety, and many of the exhibitors have ingenious displays which never fail to excite the public curiosity and interest. In this respect they vie with the makers of ignition apparatus. One company has a gear-box filled with graphite grease, the shafts being rotated by an electric motor, and a crowd gathers whenever it is in operation to look into the slimy depths.

Oils have many attractive exhibits, and are shown in a great number of varieties. The special motor oil of one company is a distilled and highly filtered product, refined from the highest grade of Pennsylvania crude oil. It has a very high fire test. Other grades are known as light, medium, heavy and extra heavy. Motor oil is manufactured for use in cold weather, and makes a particularly appropriate and seasonable exhibit. It remains fluid at a temperature of 5 degrees above zero, and is of medium body. This company's gear oil is an extra heavy-bodied lubricating oil for use in gear cases, where the use of oil rather than grease is desirable. However, to give both possibilities attention, the same concern also makes a semi-fluid gear compound or "dope," which combines the advantages of both oil and grease. Several grades of heavy oil and graphite grease are also included in this line.

Oil is put up in one-gallon cans by the various distillers, is well preserved in them and the means for spouting the same from the cans when it is to be spilled into the oil basin of the motor are secure and handy. The cans are so marked that anyone of the respective grades may be readily had in compact form, and, in a car, it is frequently found desirable to store an extra can of the same.

Another line includes a non-fluid oil, for use in gear cases, composed entirely of mineral oils, and guaranteed not to contain soapstone, graphite or rosin; gear grease, for use in ball or roller bearings, steering gears and axles; transmission compound, for use in differentials and planetary or sliding change-gears, and automobile soap, a neutral linseed oil product.

Many makers are devoting all their attention to different grades of greases. One company is particularly proud of tests recently made in Germany and published by the gazette of the Ministry of Commerce and Industries. In experiments on engines in the coal washing plant at Louisenthal a saving of 43 per cent. over oil costs was obtained, and on shaft journals the saving amounted to 63 per cent. Three factors in lubrication, according to another company, are efficiency, quality and power, and arguments are offered to show that its brand excels in all of them. The exhibitors of lubricants are:

H. T. Alexander Company, New York City.
Connecticut Oil Company, Waterbury, Conn.
Adam Cook's Sons, New York City.
Jos. Dixon Crucible Company, Jersey City, N. J.
Duffy Grease Company, New York City.
Keystone Lubricating Company, Philadelphia.
Havoline Oil Company, New York City.
G. A. Haws, New York City.
W. P. Miller's Sons, Long Island City.

The following will exhibit at the Garden show only:

Columbia Lubricant Co., New York City.
N. Y. & N. J. Lubricant Co., New York City.
Valvoline Oil Co., New York City.
Vacuum Oil Co., New York City.
White & Bagley Co., Worcester, Mass.
Wm. R. Winn, New York City.

PRESSED STEEL AND FORGING ACTIVITIES

Never in the history of the industry has pressed steel been used so much as it is in the cars of this year. Besides sidebars, crossbars, running-boards and divers small parts for chassis frames, there are brake drums, front and rear axles, hubs, caps and a variety of housings, notable among which, the Ford bottom half of the crankcase will serve as a type to illustrate the point made here. In chassis frames, considering sidebars, they belong to classifications as follows:

(A) Straight, channel section.
(B) Straight, U-section.
(C) Narrowed, channel section, without a kickup.
(D) Narrowed, channel section, with kickup.
(E) Underslung, channel section, narrowed.
(F) Laminated wood, no armor.
(G) Not laminated wood, no armor.
(H) Armored wood.

The methods of suspending the power plants are divers, and in a general way they may be classed as follows:

(a) On a subframe, motor and transmission in one unit.
(b) On a subframe, motor and transmission separate units.
(c) Eliminating the subframe, motor and transmission as a unit, with a three-point suspension.
(d) Eliminating the subframe, motor separate from transmission.
(e) Arms of motor cast integral, extending to side-bars proper, or to sub-frame.
(f) Separate drop-forged arms bolted to a flanged face, on either end of motor case, and extending across to side-bars.
(g) Separate drop-forged arm at one end of motor; other arm cast integral, both extending across to side-bars.

The exhibitors of pressed steel parts at the Palace were as follows:

Columbia Bolt & Nut Company, Bridgeport, Conn.
Driggs-Seabury Ordnance Company, Sharon, Pa.
A. O. Smith Company, Milwaukee, Wis.
Standard Metal Works Company, Thomsonville, Conn.
Standard Welding Company, Cleveland, Ohio.

The above exhibitors will show at the Garden also.

SHOCK ABSORBERS OPERATE ON MANY PRINCIPLES

Fluid compression is the principle used in two well-known devices; in one air is the medium, and in the other a glycerine mixture. The latter has cylinders with pistons, double-acting, connected between the frame and the axles at four points. On heavy touring cars these cylinders are of a size to hold about one quart of the mixture. The under side of the piston is deeply grooved, and in it are bored two small and four large holes. Their arrangement is such that the downward travel of the springs is not checked unless it is very violent. At the rebound or recoil, the four large holes are automatically closed by a valve. This checks about 85 per cent. of the recoil, and the car body rises slowly. The passengers are not bounced from their seats, and the single upper leaves of the springs, which have the duty of resisting the upward motion, are not unduly strained. Their longevity is thereby materially increased.

The pneumatic device is constructed in much the same way, and resembles the hydraulic check in outward appearance and in its method of application. The air moves from one side of the piston to the other through a by-pass of adjustable area. Owing to the compressibility of air, it is possible to make this by-pass much smaller than the valves in the hydraulic check, and so cushion the shocks by the direct compression of the air.

Another form of shock absorber is that which employs coil springs. There are two methods of employing these, both shown by reputable concerns. In one the coils are interposed between the ends of the semi-elliptics and their hangers, and in the other the coil spring is connected directly between the axles and the frame. The operation of the latter is so obvious as to require no comment. The other uses two coil springs at one end of each of the main springs, the attachment being at the shackled end. The coil springs are arranged so that they work both on the upward and the downward movement of the main springs.

Following is the list of exhibitors at the New York shows:

Ernst Flentje, Cambridge, Mass.
Gabriel Horn Mfg. Co., Cleveland, O.
Hartford Suspension Co., Jersey City, N. J.
Kilgore Mfg. Co., Boston, Mass.
J. H. Sager & Co., Rochester, N. Y.
Supplementary Spiral Spring Co., New York City.

AMONG THE MAKERS OF RADIATORS

This is one branch of the accessory business which is seldom invaded by makers of automobiles, exceptions noted include Rambler, Cadillac, Packard, and perhaps a few others. Radiators are distinctly accessory products, and, like magnetos, coils, batteries, windshields, tops, wheels and tires, are made in enor-

mous qualities, as many as 100,000 radiators being made in a single plant devoted to this class of work.

Radiators, as they obtain, may be classified as follows:

(A) Honeycomb, square, or octagon.

(B) Vertical tube, with gills.

(C) Horizontal tube, with gills.

(D) Flat plate, imitating square tube effect.

Besides these general classifications, there are:

(a) Water circulated by means of a pump.

(b) Thermo-syphon systems.

In the water circulation class will be found:

(aa) centrifugal pump circulation.

(ab) gear pump circulation.

In thermo-syphon systems there are:

(ba) Renault (over the flywheel).

(bb) Regal, with a pocket and means for distributing the water.

(bc) Grabowsky, with a steam space above the water.

(bd) Radiator same as in water cooling but of larger capacity.

Exhibitors at the Palace were:

Briscoe Manufacturing Company, Detroit, Mich.
W. J. Kells Manufacturing Company, New York.
Livingston Radiator & Manufacturing Company, New York.
McCord Manufacturing Company, Detroit, Mich.

The above exhibitors will be at the Garden including:

A. Z. Company, New York.

CARBURETERS SHOW ENCOURAGING IMPROVEMENT

It is important, this carbureter question, and to meet its every angle in the quest for perfection, many manufacturers of many minds have, for inspection and purchase, different forms of this important device, all well fitted for the work, but often varying in construction more than in principle.

A water-jacketed type shows other and somewhat marked characteristics. The water jacket, be it known, is a circular chamber outside the mixing chamber. In this instance the makers claim instant volatilization of the gasoline, inasmuch as particles from the spray which are not volatilized as they issue from (in this instance) a canopy-shaped spray, will immediately turn to vapor upon striking the inner wall which is surrounded by the warm jacket. Priming is simplified for the reason that when the lever controlling this function is raised, it lifts the needle valve, causing a rise of gasoline in the chamber. The overflow by a simple process immediately and automatically primes the motor. The makers claim no flooding, no clogging. A fixed air inlet, controlled by a screw, adjusts the air supply for all speeds, and the manufacturers aver, produces a perfect mixture at all speeds.

TO SECURE MECHANICAL ATOMIZATION

Another device (properly speaking a carbureter accessory) is upon the market which lays claims to efficiency and perfect combustion through a new form of mechanical atomization accomplished through the agency of a rapidly rotating wheel with propeller blades, which is hung within a galvanized iron mesh which atomizes the fuel as it passes into the carbureter. This apparatus is a wheel which sets between the carbureter and the intake manifold. It is said that the gasoline spray and air fed by the carbureter must pass through the wheel, causing it to revolve rapidly. The mesh thrashes it into fine spray, disintegrating the mixture and turning it into an explosive mixture.

There may be seen on exhibition a carbureter for which many good points have been claimed, among which may be mentioned independent adjustments; a noiseless auxiliary air valve; central draught for main air and gasoline spray, which prevents changing fuel levels on grades, and a needle valve construction which causes complete atomization. It is made in vertical or horizontal form, with a choice of engine connections.

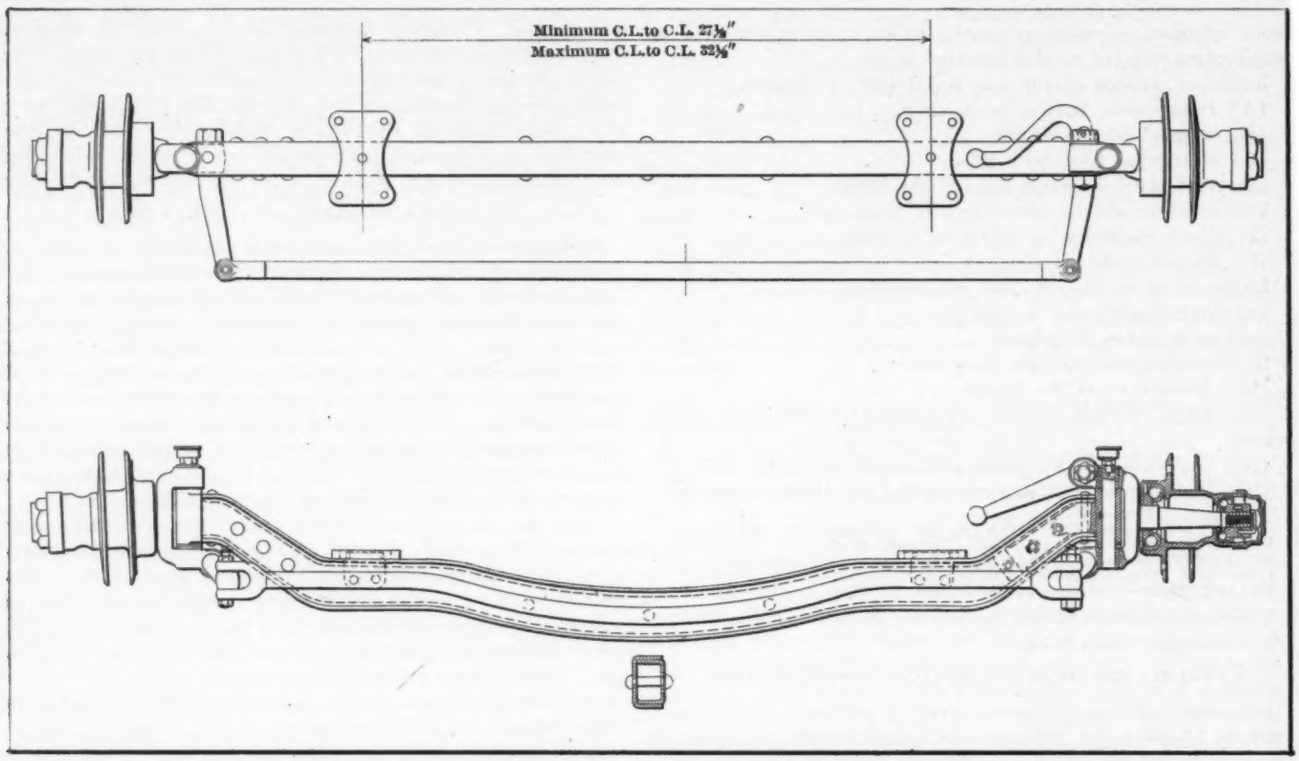
The following manufacturers exhibited at the Grand Central Palace Show:

Auto Improvement Co., New York City.
Breeze Carbureter Co., Newark, N. J.
Byrne, Kingston & Co., Kokomo, Ind.
Gasoline Motor Efficiency Co., Jersey City, N. J.
Siro Carbureter Co., Springfield, Mass.
Stromberg Motor Devices Co., Chicago, Ill.
Wheeler & Schebler, Indianapolis, Ind.

The following are exhibited at the Madison Square Garden Show:

Allen Auto Specialty Co., New York City.
Byrne, Kingston & Co., Kokomo, Ind.
Stromberg Motor Device Co., Chicago, Ill.
Waterhouse Co., Boston, Mass.
Wheeler & Schebler, Indianapolis, Ind.

On the Balcony Overlooking the Main Hall Many Leading Accessories had a Vantage Point.



Pressed Steel, Front Axle With Special Steel Knuckles in Riveted Relation as Made at the A. O. Smith Plant

MAGNETOS STRIVE FOR SIMPLICITY AND DURABILITY

Many magnetos represent many ideas and there is presented here a few suggestions covering, in bare detail, the qualifications of this very important device, as it applies itself to modern automobiles.

In connection with the magneto comes a set of spark plugs which together form a complete ignition system. There is no extra coil nor "make and break" apparatus, but cable connections, and an advance lever which locate directly the steering part. The manufacturers state that this magneto forms a standing flame capable of igniting the poorest mixture.

Many points of superiority are claimed for a medium-priced magneto, offering, among other improvements, helicoidally-shaped pole pieces, which it is said permit smooth running of the magneto, prevent demagnetization and allow throttling down and easy starting.

Ready accessibility and great strength are quoted as primal characteristics of an offering in this line. In this instance the magneto has a heavy brass base, supporting two bronze ends, with a triple magnet for the field. The armature is of the Siemens type, with two windings. The makers claim easy and quick regulation, interchangeable parts and a quick hot spark at low speed.

In conclusion it will be well to say that a number of coil makers, realizing the importance of the magneto as a factor in gasoline engine development, have entered the field and are now turning out this latter product with the same attention to detail and excellence which has marked their work in their original field of endeavor.

The following manufacturers exhibited at the Grand Central Palace Show:

Bosch Magneto Co., New York City.
J. S. Bretz Co., New York City.
Heinze Electric Co., Lowell, Mass.
Herz & Co., New York City.
Hess-Bright Mfg. Co., Philadelphia, Pa.
Lavalette & Co., New York City.
Motsinger Device Mfg. Co., Pendleton, Ind.
Nilmelior Electrical Co., New York City.
Pittsfield Spark Coil Co., Dalton, Mass.
C. F. Splitdorf, New York City.
Witherbee Igniter Co., Springfield, Mass.

The following manufacturers will exhibit at the Madison Square Garden Show:

Bosch Magneto Co., New York City.
J. S. Bretz Co., New York City.
Champion Ignition Co., Flint, Mich.
Conn. Tel. & Elec. Co., Meriden, Conn.
Heinze Electric Co., Lowell, Mass.
Hess-Bright Mfg. Co., Philadelphia, Pa.
Herz & Co., New York City.
K-W Ignition Co., Cleveland, O.
Lavalette & Co., New York City.
Motsinger Device Mfg. Co., Pendleton, Ind.
Pittsfield Spark Coil Co., Dalton, Mass.
Simms Magneto Co., New York City.
C. F. Splitdorf, New York City.
Remy Electric Co., Anderson, Ind.

A FINE ARRAY OF MOTORS PRESENTED

Despite attempts on the part of experts to portray the trend in the design of motors in automobile practice, the exhibitions seem to show a diversified state of the art with all the types as follows, represented:

(A) Water and air-cooled motors.
(B) Cylinders with valves in the head.
(C) L-type cylinders.
(D) T-type cylinders.
(E) Individual cylinders.
(F) Twin cylinders.
(G) Cylinders *en bloc.*

It would be impossible here to discuss details sufficiently to serve any useful purpose at all, it being the case that refinements in detail in order to bring them to proper notice, will demand illustrations. The exhibits at the Palace showing complete motors were as follows:

F. A. Brownell, Rochester, N. Y.
L. A. W. Motor Company, Providence, R. I.
Carlson Motor & Truck Company, Philadelphia, Pa.
Excelsior Motor Company, Chicago, Ill.

At the Garden, the motors on show will probably slightly exceed the above list.

TRANSMISSION SHOWN IN DIVERS FORMS

Three speed (with reverse) selective transmission systems are very prevalent. This is shown in the tabulations of cars, both as they were given for the A. M. C. M. A., and as the A. L. A. M. automobiles are presented in the tabulation of the cars which will be at the Garden. It is difficult to put one's finger on the top idea presented. Perhaps the wide adaption of cast iron, as a substitute for aluminum, in the casings, not only for transmissions, but for motors, as well, is the most radical departure of the year.

Certainly cast iron is lighter than aluminum if the measurement is made in terms of strength—true, aluminum is from 10 to 15 times more costly than cast iron, and, as to market conditions, it is cast iron which can be had, more readily, from many sources, and with less risk as to strength.

Gears are now made of alloy steel, in nearly every case, and the equipment used in plants, as gear cutters, planers, shapers, hobbers, etc, are designed to sustain under the work. This is one of the advances of the times, because, in former years, machine tools, as used for shaping gears, were designed to be fashioned on a basis of cast iron, machine steel, etc., and, when alloy steel first came into vogue, it was found that the machine tools were not sufficiently rigid to perform the required operations.

Gear spindles, as prime and lay-shafts in transmission systems, are made as short as possible, and large in diameter in order to defeat deformation which, especially in connection with sliding gears, even though slight, interferes with the working of the system. In matters of this sort, much improvement will be noted all along the line.

As to the materials of which gears are made, chrome nickel steel is present in conspicuous examples. Nickel steel is a prime favorite. Silico-manganese steel is making a name for stability. Vanadium steel is being taken up, and cementing grades of carbon steel are in common use.

Of the exhibitors, at the Palace, the following makers presented transmissions:

Brown-Lipe Gear Company, Syracuse, N. Y.
F. A. Brownell, Rochester, N. Y.
Cotta Transmission Company, Rockford, Ill.
Driggs-Seabury Ordinance Corporation, Sharon, Pa.
Gemmer Manufacturing Company, Detroit, Mich.
Light Manufacturing Company, Pottstown, Pa.
Muncie Gear Works, Muncie, Ind.
A. O. Smith Company, Milwaukee, Wis.
Standard Roller Bearing Company, Philadelphia, Pa.
Timken-Detroit Axle Company, Detroit, Mich.
Warner Gear Company, Muncie, Ind.
Warner Manufacturing Company, Toledo, Ohio.

In addition to the above companies which will exhibit at the Garden also, the following concerns may be included:

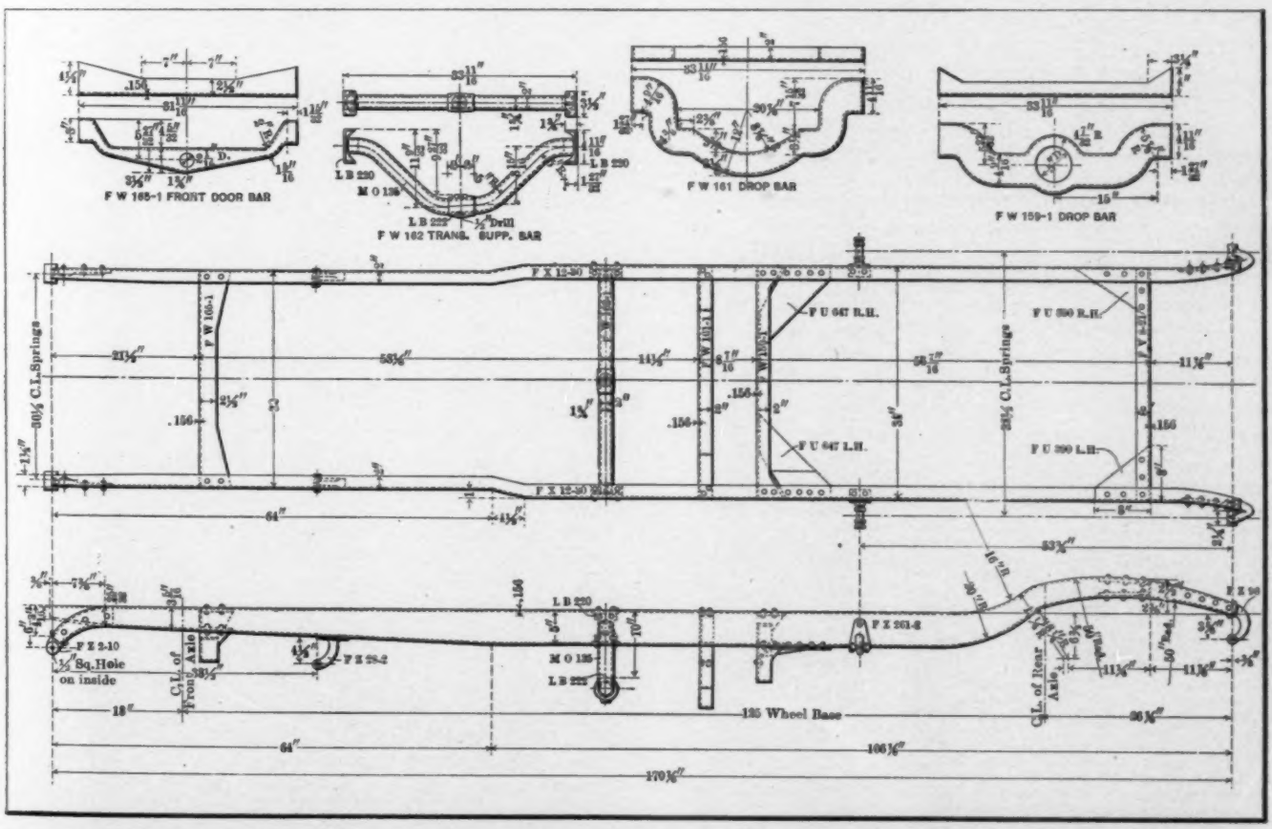
High Wheel Auto Parts Company.

Transmissions are also carried to a considerable extent by the supply dealers, a list of which is given elsewhere.

GRAY IRON FOUNDRIES EXHIBIT THEIR WARES

The extreme importance of cylinder castings and the difficulties involved in their production, considering the quantity requirement in America, has trained up a series of foundries which now produce gray iron castings for automobile work of the first quality. In addition to cylinders, there are pistons and piston rings, crank boxes, gear cases, and to some extent, small parts, all of which, in view of the shock nature of the service they must render, are from carefully selected grades of pig, in the cupola or by the natural draft process, from patterns of competence involving well-made cores, an intelligent "gaffer" and facilities.

In some cases, it is now the practice to mix a certain percentage of steel in the charge, the idea being to increase the average strength of the castings, and refinements made in



Chassis Frame With a Kick-up at the Rear and Special Shapes in the Cross Members Made at the A. O. Smith Plant.

foundry methods render this scheme feasible. The time was when to add steel to the charge was to put up with stout casting but prone to blemishes, the character of which would debar them from cylinder work, in view of the fact that cylinders must be tight as well as strong.

In the shops, with excellent facilities for making hydrostatic tests, defective cylinders are discovered without any question, and foundries are now producing such close grained work that spraying in the hydrostatic test does not transpire, leastwise within the limits demanded for strength. Cylinders are made for both water and air-cooled work with about the same facility, due to refinements in air-cooled designing, and to long practice in water-cooled work. It would scarcely seem necessary here to enlarge upon the problems involved, for if in the past there were difficulties to be surmounted, they do not now seem to deter the makers of cylinders in the leastwise. Among the exhibitors of this character of material at the Garden the following is named:

Erie Foundry Company, Erie, Pa.

SPRING MAKERS IN STRONG PRESENCE

In view of the enormous output of the year, and the fact that springs are almost exclusively in accessory plants, it is normal to expect that this industry will be heavily represented at shows, and at the Palace the spring makers' contingent presented a most pleasing array of the several types of springs.

Distinctive among the exhibits were the designs which include scroll features, they being in three-quarter and full elliptic springs, in which excellence of design included very wide plates, relatively thin members, and retainers of competence. What is true of the display at the Palace will be true of that at the Garden, and it is fortunate that the quality of material utilized in springs is now on such a high plane that spring breakages, which were once prevalent, do not now annoy autoists, unless in emergencies, for reasons that can be traced to something definite. The exhibitors of this line at the Palace were:

New Jersey Car & Spring Company, Jersey City, N. J.
Perfection Spring Company, Cleveland, Ohio.
Thomas Prosser & Son, New York City.

The exhibitors at the Garden in addition to the above will be:

American Vanadium Company, Pittsburg, Pa.
Carpenter Steel Company, New York City.

IGNITION, OTHER THAN THAT BY MAGNETO

Ignition, aside from that furnished by the magneto, covers a wide radius of action and embraces auxiliary features of the magneto as well as independent devices of a like character, and it is the purpose to touch lightly here upon a few of the many devices of this character which are on exhibition at the Madison Square Garden Show. In this résumé, the matter of car lighting will also be referred to in brief, because to do full justice to all subjects mentioned above would require many more pages.

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Geiszler Storage Battery Co., New York City.
Heinze Electric Co., Lowell, Mass.
Herz & Co., New York City.
High Frequency Coil Co., Los Angeles, Cal.
Kokomo Electric Co., Kokomo, Ind.
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C. F. Splitdorf, New York City.
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Among the noteworthy exhibitors, especially under the head of structural parts, are many whose wares entitle them to specific mention, notably, the makes of steel castings, among which, at the Palace and Garden, are:

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In addition to the above, there will be numerous exhibitors of this class of materials at the Garden.

SUPPLIES HANDLED BY RETAILING HOUSES

These jobbing houses are of benefit to the automobilist in many ways. They not only discover and bring to the public notice various articles of merit which might never obtain prominence otherwise, but also do a large business in importing foreign specialties.

The catalogs of these companies are often volumes of considerable size, listing within their covers almost everything appertaining to the automobile except the automobile itself.

Among the novelties noted in the exhibits of the supply houses was a very neat little valve lifter, to relieve the spring tension in order to enable the cotter to be removed. This device had two long arms, notched at the ends, to be placed one over the valve lift guide and the other under the spring. These arms were connected at the outer end by a toggle-joint actuated by a thumb-screw. Tightening up the screw forced the arms apart and compressed the valve spring.

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SHOWS DRAW AUTOMOBILISTS FROM EVERY STATE

ATTENDANCE at the Palace included all the old timers, who had made a name in automobile activities, and a goodly sprinkling of the second generation; taking them from the administrative buildings in the many plants, the engineering offices, and the sales establishments all over the land. In some measure, this accentuated attendance is brought about through the small interval which intervenes between the two big shows. Nevertheless, there is a big attendance of autoists, many of whom have a serious bent, but it is a critical audience, and it is making its selection with a deliberation as never before.

One of the old-timers seen at the show was Charles Wridgway, who has just returned from England accompanied by W. M. Letts, of London. The latter is here for the shows and is looking for a good low-priced car to introduce in Great Britain.

F. E. Moskovics was at the show the early part of the week, enthusiastic over the prospects of the aviation meet which he is going to conduct at Los Angeles from anuary 12 to 20.

No show will be complete without the "big fellow from the West," as Pat Hussey is known by his intimates.

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The Firestone Tire & Rubber Company, of Akron, O., is represented by H. S. Firestone, president; Robert J. Firestone, sales manager, and Frank H. Martin, manager of the Chicago branch. They are stopping at the Hotel Astor.

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J. O. Heinze, general manager of the Heinze Electric Company, Lowell, Mass., will stay for both shows and is stopping at the Knickerbocker. The same company is also represented by Pierre J. Legare, who is staying at the Hotel Seville.

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B. S. Shimer, of Milton, Pa., president Star Speedometer Company, is among the visitors at the show. He is stopping at the Hotel Astor.

The Timken-Detroit Axle Company, of Detroit, Mich., is represented at the show by W. R. Timken, president; H. H. Timken, vice-president; A. R. Demory, second vice-president; E. W. Lewis, secretary and treasurer; H. W. Alden, chief engineer; F. C. Gilbert, assistant secretary; W. H. H. Hutton, Jr., purchasing agent; E. B. Lausier, assistant sales manager.

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W. S. Gorton, secretary and general manager; C. E. Miller and H. C. Clark are at the show in the interest of the Standard Welding Company, of Cleveland, Ohio.

The Pennsylvania Tire Company, of Jeanette, Pa., is represented by C. N. Du Puy, general sales manager, and A. M. Jerome, manager.

C. F. Pratt, president and general manager of the Ohio Motor Car Company, is visiting the show in the interest of that concern.

The Mora Motor Car Company, of Newark, N. Y., is represented at the show by J. S. Draper, general sales manager; S. H. Mora, president; W. M. Freeman, treasurer; W. H. Birdsall and T. C. Colins.

Among the representatives of the Driggs-Seabury Ordnance Company, of Sharon, Pa., at the show, are C. W. Blackman, general sales manager; John Stevenson, president; H. W. Bondy and R. M. Bean.

The Gabriel Horn Manufacturing Company, of Cleveland, is represented by C. H. Foster, J. F. Gibler and H. D. Preston.

Among the representatives of the American Motor Truck Company, of Lockport, N. Y., attending the show, are E. B. Olmstead, Charles R. Bishop, Robert Hall, H. J. Babcock and R. F. Wells.

The Diamond Rubber Company has a big force at the show. Among those noticed were W. P. Miller, O. J. Woodward, J. H. Braden and S. J. Bates.

Charles Motz, president of the Motz Clincher Tire Company, of Akron, Ohio, was seen at the Palace during the week.

President August Schacht and Joseph Berle, of the Schacht Manufacturing Company, of Cincinnati, are in town during the shows.

H. S. Raymond, general sales manager and second vice-president of the Goodrich Tire Company, was also a visitor at the show this week.

Among the representatives of the Goodyear Tire Company noticed were G. M. Stadelman, W. D. Shilts, L. C. Van Beaver, F. A. Seiberling and C. W. Seiberling.

The Regal Motor Car Company, of Detroit, Mich., is represented by F. W. Haines, George W. Franklin, George D. Wilcox and E. Peake. These gentlemen are stopping at the Belmont Hotel.

J. W. Gilson, sales manager of the Mitchell Motor Car Company, Racine, Wis., one of the best known men in the trade, accompanied by J. M. Cram and E. C. Beyer, is staying at the Hotel Manhattan.

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The Timken-Detroit Axle Company, of Detroit, Mich., is represented at the show by W. R. Timken, president; H. H. Timken, vice-president; A. R. Demory, second vice-president; E. W. Lewis, secretary and treasurer; H. W. Alden, chief engineer; F. C. Gilbert, assistant secretary; W. H. H. Hutton, Jr., purchasing agent; E. B. Lausier, assistant sales manager.

The Timken Roller Bearing Company is represented at the shows by H. H. Timken, president; W. R. Timken, vice-president and treasurer; Herman Ely, secretary; H. W. Alden, consulting engineer; R. R. Abbott, metallurgist; F. A. Miller, purchasing agent; A. G. Gladden, cashier; Herbert Vanderbeek, engineer, and F. A. Cornell, sales representative.

W. S. Gorton, secretary and general manager; C. E. Miller and H. C. Clark are at the show in the interest of the Standard Welding Company, of Cleveland, Ohio.

The Pennsylvania Tire Company, of Jeanette, Pa., is represented by C. N. Du Puy, general sales manager, and A. M. Jerome, manager.

C. F. Pratt, president and general manager of the Ohio Motor Car Company, is visiting the show in the interest of that concern.

The Mora Motor Car Company, of Newark, N. Y., is represented at the show by J. S. Draper, general sales manager; S. H. Mora, president; W. M. Freeman, treasurer; W. H. Birdsall and T. C. Colins.

Among the representatives of the Driggs-Seabury Ordnance Company, of Sharon, Pa., at the show, are C. W. Blackman, general sales manager; John Stevenson, president; H. W. Bondy and R. M. Bean.

The Gabriel Horn Manufacturing Company, of Cleveland, is represented by C. H. Foster, J. F. Gibler and H. D. Preston.

Among the representatives of the American Motor Truck Company, of Lockport, N. Y., attending the show, are E. B. Olmstead, Charles R. Bishop, Robert Hall, H. J. Babcock and R. F. Wells.

The Diamond Rubber Company has a big force at the show. Among those noticed were W. P. Miller, O. J. Woodward, J. H. Braden and S. J. Bates.

Charles Motz, president of the Motz Clincher Tire Company, of Akron, Ohio, was seen at the Palace during the week.

President August Schacht and Joseph Berle, of the Schacht Manufacturing Company, of Cincinnati, are in town during the shows.

H. S. Raymond, general sales manager and second vice-president of the Goodrich Tire Company, was also a visitor at the show this week.

Among the representatives of the Goodyear Tire Company noticed were G. M. Stadelman, W. D. Shilts, L. C. Van Beaver, F. A. Seiberling and C. W. Seiberling.

The Regal Motor Car Company, of Detroit, Mich., is represented by F. W. Haines, George W. Franklin, George D. Wilcox and E. Peake. These gentlemen are stopping at the Belmont Hotel.

J. W. Gilson, sales manager of the Mitchell Motor Car Company, Racine, Wis., one of the best known men in the trade, accompanied by J. M. Cram and E. C. Beyer, is staying at the Hotel Manhattan.

Thomas Hart, president and general manager; Fred J. Pardee, assistant manager, and L. A. Hart, who are all stopping at the Hotel Astor, are representing the Inter-State Automobile Company, of Muncie, Ind.

Fred J. Pardee, one of the best-known men in the trade, is receiving congratulations on his joining the staff of the Inter-State Automobile Company, of Muncie, Ind., as assistant to President Hart.

The Remy Electric Company, of Anderson, Ind., is well represented by W. R. Poland, G. O. Driscoll, Fred Urban and C. Herbel Morris, who are stopping at the Hotel Wolcott.

J. A. Cain and Percy Barter, of the McCord Manufacturing Company, are among those registered at the Knickerbocker.

A. R. Miller, who represents Barthol & Daly, and also the Simm's magneto, is stopping at the Knickerbocker.

W. C. Marmon and H. C. Marmon, of the Nordyke & Marmon Company, Indianapolis, Ind., are at the Knickerbocker. H. H. Rice, sales manager, and A. R. Heiskell, purchasing agent, of the same company, are at the Manhattan.

H. O. Smith, president; George Weideley, vice-president, and R. W. Macey, Jr., of the Premier Motor Manufacturing Company, of Indianapolis, Ind., are stopping at the Engineer's Club. R. I. Eads, New England manager, is at the Breslin.

V. A. Longaker, president of the American Motor Car Company, of Indianapolis, Ind., is registered at the Broztell. Fred I. Tone and C. F. Baker are at the Cadillac.

The Simplex Motor Car Company, of Mishawaka, Ind., is represented by D. A. Shaw, treasurer, and George S. Waite, sales manager, who are stopping at the Astor.

E. J. Moon and W. R. Flint, of the Moon Motor Car Company, of St. Louis, are registered at the Woodstock.

The New Grand has among its guests this week C. Van Dervoort, sales manager, and F. G. Salisbury, of the Moline Automobile Company, of Moline, Ill.

Among those registered at the Hermitage are George M. Dickson, W. G. Wall and J. M. Clarke, of the National Motor Vehicle Company, of Indianapolis, Ind.

W. H. Schwartz has resigned his position as manager of the Boston branch of the Old-Oakland Motor Company and has been appointed sales manager of the Metz Manufacturing Company, of Waltham, Mass. Mr. Schwartz was associated with the Waltham Manufacturing Company in the Orient bicycle days. For several years past Mr. Schwartz has been prominently identified with the trade. Mr. Schwartz was seen at the show, representing the C. H. Metz Company, which has a very interesting exhibit.

H. D. Van Brunt has retired from the firm of Willis & Van Brunt, of Syracuse, N. Y., and his interest has been taken over by F. S. Willis, who will hereafter conduct the business under the name of the Willis Motor Car Company, at the same address, 231 North Clinton street.

A. C. Newby, of the National Motor Vehicle Company, of Indianapolis, Ind., who has been confined to his home with a severe cold, has fully recovered and is expected at the show.

President C. A. Shaler, R. B. Dunlap, sales manager, and M. E. Faber, electrical expert of the C. A. Shaler Company, Waupun, Wis., are at the Hoffman House.

George S. Atwater, sales manager of the Tray Plate Battery Company, Binghamton, N. Y., is at the New Grand. Stanley Bayless, secretary and general manager, is at the Collingwood.

C. D. Hudson, manager of the Seeley Sales Corporation, Detroit, is at the Grand View.

Irving W. Adams, Superintendent, High Frequency Ignition Coil Company, Los Angeles, is at the Woodstock.

Charles W. Harris, General Manager of the Wayne Oil Tank & Pump Company, Ft. Wayne, Ind., is at the Knickerbocker.

President William Young, of the St. Louis Supplementary Spiral Spring Company, St. Louis, is at the Empire. Mr. Young is in town for a double purpose—to attend the shows and to prosecute suits for infringements of the famous device patented and made by his company.

President G. F. Discher, Garage Equipment Company, Milwaukee, Wis., and Sales Manager Paul G. Niehoff are at the Park Avenue. L. J. Miley and F. H. Smith, sales department, are at the Breslin.

George Schebler, of Wheeler & Schebler, Indianapolis, is at the Cumberland.

Carl J. Holdrege, sales manager, Stromberg Motor Devices Company, Chicago, and Harvey Goodwin, manager, Boston branch, are at the Cadillac.

Fred W. Smith and A. E. Sweet, of the Point Spark Plug Company, Aberdeen, S. D., are at the Cadillac.

Fred L. Holmes, manager, and Harry Matthews, purchasing agent, Jackson Automobile Company, Jackson, Mich., are at the Astor.

Elmer Apperson, of the Apperson Bros. Automobile Company, Kokomo, Ind., who has been very ill with a severe cold for the past two weeks, has gone to Florida to recuperate.

President Frank Briscoe, Sales Manager F. A. Harris and Advertising Manager J. M. Evans, of the Brush Runabout Company, Detroit, are at the Belmont.

General Manager George Kissel, of the Kissel Motor Car Company, Hartford, Wis., is at the Belmont.

W. H. Wood, of the Empire Motor Car Company, Indianapolis, Ind., visited the Palace Show Tuesday.

Charles P. Henderson, vice-president, and H. C. Lathrop, secretary, of the Henderson Motor Sales Company, Indianapolis, are at the Empire.

President J. J. Cole and C. S. Crawford, engineer, of the Cole Motor Car Company, are at the Empire.

Sales Manager H. A. Githens, G. & J. Tire Company, Indianapolis, is at the Astor, and F. A. Drake and R. W. Weiss, of the sales department, are at the Breslin.

Charles S. Monson, Western sales manager for Gray & Davis, with headquarters in Detroit, is at the Astor.

George H. Strout, sales manager, and Wallace L'Hommedieu, sales department, Apperson Bros.' Automobile Company, Kokomo, Ind., are at the Astor.

No show would be complete without Courtland D. Cramp, of the William Cramp & Sons' Ship & Engine Building Company, of Philadelphia, who is very much in evidence this week.

MAY BE GARDEN'S LAST AUTO SHOW

Historic Madison Square Garden, the scene of so many successful automobile exhibitions, must in time, it is rumored, give way to a business structure, as the property is becoming too valuable as a business centre to continue as an auditorium for the purposes for which it is now used. According to William F. Wharton, one of the board of directors of the Madison Square Garden Company, six offers have been made during the past year for the property, and the bids are receiving serious consideration. What appears to be a matter of the utmost importance is whether another similar building—so far as the ampitheatre is concerned—will be erected in New York City. Mr. Wharton, who was a prime mover in the agitation for the present Garden, says that the need of such a building is most evident, and that he would do all in his power to have another constructed provided the present one is razed, and the suggestion that the site of the present armory of the Twenty-second Regiment, Engineers, N. G. N. Y., at Sixty-eighth street and Broadway, which is available, should be taken for this public meeting place met with his hearty approval. In discussing the situation, Mr. Wharton expressed himself as follows:

"It may be next week or not until next year that Madison Square Garden passes out of the hands of the present owners," he said, "but, be the day near or distant, it is bound to come some time. The offers last year were all brought to us by agents."

STUDEBAKER AND E-M-F COMPANIES STILL FIGHTING

DETROIT, Jan. 3—Apparently there is to be no immediate cessation of hostilities on the part of the Studebaker Automobile Company in its efforts to harass the E-M-F Company pending a final settlement of the question as to whether the selling agreement formerly existing between the two companies, and which was rescinded by President Walter E. Flanders of the E-M-F Company, could thus be annulled.

After a lengthly argument before Judge Swan, in the United State Circuit Court, last Thursday, the Studebaker Company was permitted, upon its own request, to withdraw its suit against the E-M-F Company, it being made a condition of the withdrawal that in the event it was desired to begin a similar action it would be started within ten days and in the same court.

Immediately after withdrawal of the suit, Studebaker attorneys began to skirmish to secure a temporary restraining order which would again tie up the local factory. Judge Severens was once more appealed to at Kalamazoo, but as he had already gone over the facts in the case and had refused an injunction, he declined to interfere. Judge John W. Warrington, of the United States Court of Appeals at Cincinnati, was next sought, and a new bill of complaint, drafted along practically the same lines as the original, was submitted to him. He also refused to grant a restraining order, but agreed to hear an application for a temporary injunction, the hearing being set for January 10.

The bill of complaint will have to be filed in the United States District Court here, as Judge Warrington will concern himself only with hearing the application for an injunction. This will, of course, compel the E-M-F Company to put in an appearance at Cincinnati, and probably go over the same ground that was covered before Judge Severens, at Kalamazoo, the only difference being that in the present instance Messrs. Fish, Studebaker and Eames, of the Studebaker Company, appear as officials of the latter, instead of minority stockholders in the E-M-F Company.

Meantime the fight has assumed a new angle, which may result in the ousting of Messrs. Fish, Studebaker and Eames from the board of directors of the E-M-F Company. The three men have been made defendants in a suppressed suit filed in the Wayne County Circuit Court by every other stockholder in the E-M-F Company, under an old Michigan statute which gives circuit courts jurisdiction over the actions of directors in domestic corporations where bad faith and gross misconduct are charged. The bill of complaint recites details of the transactions between the E-M-F and Studebaker Companies as showing the misconduct of the trio who have been made defendants in the action. It is alleged that their refusal to take the number of cars agreed upon was in pursuance of a plan to gain control of the E-M-F Company and make it a part of an $80,000,000 merger the Studebaker Company had been fostering, a project which it endeavored to get President Flanders to entertain.

There was a stormy session of the E-M-F directors last week, the seven members of the board being present. By formal vote President Flanders' action in rescinding the agreement with the Studebaker Automobile Company was ratified, although Messrs. Fish, Studebaker and Eames protested vigorously in an endeavor to have action postponed for one week, the evident intention being to, in the meantime, see what further legal steps could be taken toward preventing a complete severance of the relations whereby the Studebaker Company was to be sole distributor of E-M-F products.

An interesting phase of the matter has come to light through the assertion of agents who have contracts with the Studebaker Automobile Company for the sale of E-M-F cars that they are being advised by the Studebakers that they had better sign up with the Detroit company for their own protection, and that they can secure the return of deposits made by them with the Studebaker Company. This action is interpreted at this end of the line as indicating that the Studebaker Company is desirous of saving itself from the possibility of litigation.

Studebaker Company Files New Bill of Complaint

DETROIT, Jan. 4—A second bill of complaint was yesterday filed by the Studebaker Automobile Company against the E-M-F Company in the United States Court, the first bill having been withdrawn.

The present bill is drafted along much the same lines as the first, the only new feature of note being a series of affidavits signed by F. S. Fish, chairman of the executive committee of the Studebaker Company, with a view to controverting certain facts in the legal battle. Mr. Fish admits that he actively tried to promote the big merger that has been hinted at, but declares that the idea was suggested to him by President Walter E. Flanders, of the E-M-F Company. In another affidavit he declares that although the schedule of August, 1909, provided for 15,200 cars to be manufactured by the E-M-F Company, for which the Studebaker Company was to be sole distributor, Hayden Eames, general manager of the Studebaker Company, had no legal right to bind the Studebaker Company to take that many cars.

The suit instituted yesterday will come up in its regular order in this district, but the application for a temporary injuction made to Judge Warrington, in Cincinnati, will be heard there January 10.

AVIATOR DELAGRANGE KILLED BY FALL

BORDEAUX, FRANCE, Jan. 4—Another name was added to the growing list of aeronautic fatalities to-day. Léon Delagrange, a pupil of Blériot, was instantly killed by a fall from a height of 65 feet when one wing of his monoplane collapsed. The machine was one of the Blériot cross-Channel type. In place of the 25-horsepower Anzani motor, which is the regular equipment, Delagrange had substituted a 50-horsepower Gnome, and it is believed that the strain of this heavy and powerful motor was responsible for the accident.

Léon Delagrange was a pioneer in aviation. Two years ago, when he was using a Voisin biplane, he and Farman were rivals, and alternated in establishing world's records for duration of flight. Last Summer he became a convert to the monoplane type, and joined the Blériot forces.

RUBBER EMPLOYEES STILL ON STRIKE

HARTFORD, CONN., Jan. 3—The strike of the tire makers of the Hartford Rubber Works Company continues. The strikers report that about 30 men are now engaged in building tires, and, of these, 13 are inspectors. This information comes from one of the strikers who returned to work and later rejoined the belligerents. The strikers still maintain pickets about the factory.

Superintendent C. B. Whittlesey has sent out, it is said, a number of circular letters to prospective help. All the men received the one day's pay due them on Monday of this week and it is said that most of the men received official notification that their services were no longer needed.

There is a persistent rumor in circulation that the company was anxious to bring about the strike and that there is some likelihood of the works removing elsewhere.

Reo Challenger Center of Interest of Winter Scene

When the Reo, driven by Ray M. Owen, made a perfect score in the New York-Atlanta run, it challenged all other perfect-score cars to a further contest calling for a detailed technical examination. None of them saw fit to accept the challenge, so this name has been adopted for that model. It will henceforth be known as the Reo Challenger.

Patent Holders Build Own Product, Now—Owing to the expiration by limitation of the license heretofore held by the Livingston Radiator Company, New York City, the manufacture and sale of Livingston radiators will be conducted in the future by the Livingston Radiator & Mfg. Co., Inc., of 312 West Fifty-second street, New York. The El-Arco Radiator Company, formerly the Livingston Radiator Company, will continue the manufacture and sale of El-Arco radiators after the first of the year 1910.

Borax King Buys a Stearns—F. M. Smith, the California Borax King, who has made "20-Mule Team Borax" famous all over the world, has recently placed an order for a six-cylinder, 90-horsepower Stearns. Mr. Smith will use this car for fast work across the California and Nevada deserts in connection with his borax enterprises. In addition to the car, Mr. Smith has given an open order for complete equipment, embracing both necessities and luxuries, that can be added to a car.

Hartford Officials' Successful Trip—H. E. Fields, vice-president of the Hartford Rubber Works Company, and M. C. Stokes, manager of the bicycle-tire department, have returned from a month's trip to the west coast in the interest of the company. Business is reported to be unusually good at the various agencies of the company in that section of the country. Among the various cities visited were, Chicago, Denver, Portland, San Francisco, Seattle, and Los Angeles.

Truck Capacity Doubled—So rapidly has the 1909 allotment of trucks of the Gramm-Logan Motor Car Company, Bowling Green, O., sold, that plans for another large factory with a capacity of 1,000 truck chassis to cost $96,000 have been completed. This will be equipped with the very latest machine tools. The 1910 trucks are nearly all contracted for.

Croxton-Keeton Doing Lots of Business—For the excess business of 1910, now beginning to come in, the Croxton-Keeton Motor Company of Masillon, O., is building, and has nearly completed, a new plant at Walnut and Canal streets, that city.

IN AND ABOUT THE AGENCIES

Recent Selden Agencies—The Selden Motor Car Sales Company has been established in Kansas City, Mo., at 913 East Fifteenth street, and will be in charge of M. B. Russ. J. V. Moore has secured the local agency for Oklahoma City, Okla., and together with the Regal agency will occupy a handsome new garage. In Chicago the Selden is to be represented by the Bullock Motor Company, the principal owners of which are T. H. Bullock and P. D. Bauld. The recently incorporated F. A. Ballou Company, of Buffalo, N. Y., will represent the Selden in that city. Mr. Ballou is well known in the motor-boat business.

Rauch & Lang, Minneapolis, Minn.—Announcement has been made of the organization of the Hughes Motor Car Company, which is to represent the Rauch & Lang Company in this city. The new company is planning a new garage and charging station at Harmon place and Twelfth street, to cost $20,000. Raymond L. Lunt, who will be in charge, is now at the Cleveland factory learning the fine points of the cars. After Jan. 15 the company will also take over the St. Paul territory.

Stewart Speedometers, San Francisco—A. C. Cowan has been appointed Western sales manager of the Stewart & Clark Mfg. Co., and will establish headquarters on Golden Gate avenue, San Francisco.

Demot, Minneapolis, Minn.—Arrangements have just been concluded by which the Pagel-Allen Company acts as agent for the Demot Car.

Exide Batteries, Houston, Tex.—The Imperial Motor Car Company has just taken on the agency for Exide batteries.

PERSONAL TRADE MENTION

D. C. Fenner, formerly with the Knox Automobile Company's New York branch, is now located at the factory in Springfield, Mass., where he is concerned primarily with the commercial vehicle sales end. Mr. Fenner has been with the Knox commercial vehicle department for a number of years, but has never found as much activity in that line as just at the present time.

George A. Horner has been appointed factory manager of the Rapid Motor Vehicle Company's plant at Pontiac, Mich., which is said to be the largest in the world devoted exclusively to commercial vehicles.

W. H. Kirkpatrick has resigned his position as sales manager of the Peerless Motor Car Company, of Cleveland, and has severed his relation with the company, taking effect January 1.

MICHELIN TIRE CO'S NEW MANAGER

MILLTOWN, N. J., Jan. 3—Following the retirement of J. C. Matlack, J. Hauvette-Michelin, a nephew of Edouard Michelin, president of the four great Michelin tire factories, has been elected vice-president and general manager, with headquarters at Milltown.

Mr. Michelin, who now takes charge of the American interests, is a man of long experience abroad, both in the manufacture and sale of tires.